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FACTORS INFLUENCING THE PROGNOSIS IN ACUTE INTESTINAL OBSTRUCTION:[1] PART I. GENERAL.

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THE prognosis of acute intestinal obstruction in general is influenced by the following major factors, each of which will be discussed in turn.

Delay in diagnosis is a common cause of poor prognosis. Therefore we must learn how to recognize that a patient has an obstruction, even when the clinical features are not typical. Whether it is the small bowel or the large bowel that is obstructed influences the treatment and with it the prognosis. The choice of treatment lies particularly between suction decompression and surgical procedures. The indications, contraindications, technical difficulties and misuse of suction decompression will be pointed out. Pre-operative preparation, the type of anæsthesia, and the choice of surgical procedure will be mentioned. The prognosis is affected adversely by faulty surgical technique and favourably by the correct use of intravenous infusions. Distension in the majority of cases is not only the result of delay but also constitutes in itself a major surgical problem. Measures to reduce distension before, during and after operation will be discussed. Strangulation obstruction is such a serious problem and so affects the prognosis that separate consideration of its problems is warranted. We must learn the distinguishing features of simple and strangulating obstructions as the latter condition demands immediate operation. The indications for and the method of resection of devitalized bowel merit consideration. The influence of age, obesity, malnutrition, heart disease and other medical conditions upon the prognosis in general will be outlined. After these general considerations, the special problems associated with the different ætiological types of obstruction will be considered. Throughout the essay, reference will be made, where indicated, to authoritative writings on the subject. In an appendix to the text, a consecutive series of 154 cases of acute intestinal obstruction in which operation was performed by the author will be analysed with regard to the mortality. The personal observation and experience gained in managing these operative cases as well as many others treated conservatively form the basis of this essay.

[1] The winning essay for the Henry Simpson Newland Prize in Surgery, 1958.

DIAGNOSIS.

Of all the factors influencing the prognosis in acute intestinal obstruction, delay in reaching a complete diagnosis is perhaps the most serious. This must be avoided if the prognosis is to improve. It is necessary to analyse the symptomatology of acute intestinal obstruction in some detail, so that it may be shown how variation in the typical symptoms and signs may confuse the diagnosis

and delay the institution of effective treatment. The clinical features of strangulating obstruction will be dealt with later.

Clinical Features.

Pain.

Intestinal colic is present in the vast majority of cases of acute intestinal obstruction, and is an important diagnostic feature. However, in some cases the pain may be absent, minimal or not distinguishable as colic. In this series of 154 cases, diagnosis and treatment were delayed by the relative absence of pain in (*a*) seven patients with large bowel obstruction, four of which were due to volvulus, and three to carcinoma; (*b*) 15 patients with small bowel obstruction, 14 of which were due to mechanical obstructions occurring in the early post-operative period. Mental patients often disregard pain, and some patients are so sick that they do not complain of pain. Unless these facts are realized the diagnosis may be so seriously delayed that it is made too late to save the patient.

Vomiting.

Vomiting occurs early in small bowel obstruction, particularly if the jejunum is involved. At first it consists of gastric contents, then it is bile stained and later yellowish brown with a fæculent smell. It should be noted that vomiting occurs much later in colonic obstructions, and, in many cases, may not be a significant feature. However, it may occur early in cases of right-sided colonic obstruction, particularly when there is an incompetence of the ileo-caecal valve. It is fatal to wait for the appearance of fæculent vomiting or aspirations before the diagnosis of obstruction is made. As has been stated elsewhere, this is a sign of impending dissolution rather than of intestinal obstruction. In all cases, the vomitus should be inspected and smelt. With experience, it is possible to diagnose small gut aspirations by the colour and smell.

Distension.

Distension is one of the most important signs of obstruction. It is most prominent in colonic obstruction, less so in small bowel obstruction and least in jejunal obstruction. If the patient is enormously distended, the chances are that he has a volvulus of the sigmoid colon or caecum. Such patients may be admitted to hospital with the diagnosis of ascites or large ovarian cyst, particularly if the patient happens to be a psychiatric problem and disregards or denies any pain. The technical difficulties associated with distension will be discussed later.

Constipation.

In most cases, absolute constipation for fæces and flatus is the rule, though very often the bowels act once soon after the onset of acute obstruction. It must be realized that the gut distal to the obstruction is quite capable of peristalsis and that there may be more than one bowel action and frequent passage of flatus. For some years it has been the practice to give enemata to patients suspected of having an obstruction. As a diagnostic measure, the result is often equivocal; the junior nurse may report "a little flatus and a slightly fæcal-stained result". Enemata, however, are of value, therapeutically, in cases of fæcal impaction, and may entirely relieve the obstruction. In other cases of colonic obstruction, they may relieve the acute exacerbation and allow the patient to be prepared for elective surgery. A significant finding in the management of the obstruction is the relief of symptoms gained by the enemata. If a sick patient is persistently asked about flatus, he will often state he is passing it just to agree with the examiner. Others will think belching is meant and will blithely state they are passing flatus when in fact they are belching wind. The effect of enemata on the interpretation of a subsequent flat X-ray examination of the abdomen will be discussed later.

"Splash."

If a stethoscope is placed on the abdomen in varying positions and the patient is gently shaken, a "succussion splash" may be heard in cases of intestinal obstruction. This is a most important sign, and yet is not widely known. It is really a sign of dilated intestines, and is present in cases of peritonitis and of paralytic ileus as well as in those of mechanical obstruction. The author has found the sign of extreme value when associated with intestinal colic, and believes that when the sign is more widely accepted it will, in some measure, assist in the early diagnosis of intestinal obstruction and so improve the prognosis.

Constitutional Signs.

In most cases of acute obstruction, the patient is obviously sick. However, patients with large bowel obstruction may appear to be relatively well, and yet the obstruction be far advanced. If the obstruction persists, sudden collapse may occur. Persistent tachycardia is one of the most significant findings, and should warn the surgeon that the obstruction has not relented.

Visible Peristalsis.

Visible peristalsis must always be specifically looked for, and is a reliable sign of mechanical obstruction, although it may occur when a functional obstruction in the early post-operative phase is recovering. In general, it is more common in small gut obstructions than in large.

Palpable Coils of Gut.

Palpable coils of gut are almost diagnostic of intestinal obstruction, and are felt by gently placing the flat of the hand on the abdomen and feeling the uneven contour. Some experience is necessary before the examiner will be confident of this sign.

"Ladder Pattern."

"Ladder pattern" is present only in advanced obstructions, and is usually an indication for operative interference after a short period of suction decompression and intravenous therapy.

Turbulent Borborygmi.

Turbulent borborygmi coincident with spasms of intestinal colic are very suggestive of mechanical obstruction, but may occur in the recovery phase of a functional obstruction. Too much reliance should not be placed on the presence or absence of bowel sounds, but a high pitched tinkling note associated with a peristaltic rush is almost diagnostic. However, it is worth noting that in cases of advanced mechanical obstruction the bowel may be exhausted and the peristaltic sounds diminished or practically absent. A similar finding may be present in mechanical obstructions in the early post-operative period.

Hernia.

The hernial orifices must be inspected in all cases of acute abdominal pain and may indicate that the case is one of obstruction caused by a strangulated hernia. A small strangulated femoral hernia in an obese female was recently diagnosed as "gastritis" and treated as such. She eventually came to operation in a condition much worse than was necessary.

Differential Diagnosis.

The diagnosis of acute intestinal obstruction may be delayed because of atypical symptomatology or because another acute abdominal condition has been diagnosed. Simple occlusive intestinal obstruction must be distinguished from the following conditions: (*a*) Paralytic ileus (this will be discussed in detail later). (*b*) Gastro-enteritis. Food poisoning, drug sensitivity or entero-colitis may lead to severe intestinal colic, and a hypersensitive patient may react so violently that one thinks he is obstructed. Usually the history, the general condition and the response to conservative treatment will clear the diagnosis. (*c*) "Windy pains." These occur as the intestine recovers its contractility after an abdominal operation and may be severe. The good general condition, the time interval after operation and the X-ray picture suggest the diagnosis. (*d*) Colic of other origin. Renal and biliary colic may be accompanied by vomiting, constipation and distension, but the location and radiation

of the pain are characteristic. (*e*) Torsion of an ovarian cyst. In this condition, the pain may be in the lumbar region, a mass may be palpable, but vomiting and constipation are not a feature. (*f*) Gross ascites. Some cases of large bowel obstruction, particularly volvulus, may be mistaken for cases of ascites due to peritoneal metastasis and vice versa. The presence of shifting dullness is a distinguishing feature. (*g*) Colitis with distension. The author has seen a case of fulminating ulcerative colitis in which the large bowel became enormously distended and atonic so that organic obstruction was diagnosed. In ulcerative colitis the obstruction is never complete, and an enema will bring away flatus, while the toxic symptoms are usually greater. (*h*) Uræmia. Abdominal pain, distension and vomiting may occur in uræmia. Differentiation is exceedingly difficult, especially in elderly patients. The low urinary output, the low specific gravity of the urine, and the presence of albumin and casts may be helpful in the diagnosis. The tongue may be dry and furred, the breath uriniferous, the bladder distended and the blood urea level persistently high in uræmia.

Radiological Diagnosis.

Radiological signs will be dealt with in considerable detail, as they often indicate the diagnosis and extent of the obstruction. Radiological signs suggestive of acute intestinal obstruction are present in the majority of cases within six to eight hours of the onset of the obstruction. Thus no effort should be spared to obtain first quality films. If it is at all possible, these should be taken in the X-ray department rather than with portable machines at the bedside, as films obtained with the latter are often not diagnostic. Three views at least should be taken, with the patient in the supine, in the erect, and in the left lateral recumbent positions. The supine view primarily shows the distribution of gas in the bowel, especially the colon, and helps to localize the point of obstruction. Making this film in steep Trendelenburg may often be of assistance. The fluid-filled coils are then displaced upwards, and this permits better visualization of any gas-containing coils retained or fixed in the pelvis. The whole abdomen should be included. In addition, a separate view of the diaphragm may be helpful in differentiating a perforated ulcer. The erect film demonstrates the presence of fluid levels in addition to gas shadows. The left lateral recumbent film is particularly useful in patients too ill to be postured for an erect film. This will demonstrate the presence of fluid levels and, in addition, will demonstrate any fixity of the distended loops. In patients with peritonitis or strangulated obstruction, the fluid levels will be scattered at various levels throughout the abdomen. In patients with paralytic ileus and simple obstruction, the loops rearrange themselves in such a fashion that the fluid levels in the various loops are all in the same horizontal plane.

Interpretation of Films.

Normal Gas Shadows.—Gas is normally present throughout the alimentary tract, but is visible on a skiagram only in the stomach and the colon of the adult. However, in children under three years of age, gas may be normally seen in the small intestine.

Gas Shadows in Intestinal Obstruction.—Gas shadows appear on the skiagram before fluid levels as the swallowed air is immediately arrested at the site of obstruction, whereas fluid takes longer to accumulate. The gas-filled loops of bowel have some characteristic features which enable a fairly accurate localization. The loops of jejunum show typical cross-striation due to the valvulæ conniventes. This cross-striation is less marked in the mid part of the small bowel, and in the lower ileal loops is poorly marked or absent. The differentiation of these ileal loops from the pelvic colon forms a most difficult diagnostic problem. If such a loop is colonic, it should be possible to trace its continuity with the rest of the colonic shadow. Sometimes, the distinction is so difficult that a barium enema X-ray examination is necessary to differentiate the two. The distended loops of small bowel lie with their long axis transverse, and are located in the central portion of the abdomen. The gas shadows are separated by narrow lines representing the thinned out walls of the small bowel. The thickening of the opaque lines suggests ascites or an inflammatory exudate (e.g. in peritonitis or strangulation). In the later stages, the distended coils of smal bowel are arranged in parallel transverse lines, known as a "ladder pattern". However, this is a sign of advanced obstruction, and its appearance should not be awaited.

The gas-filled loops of the colon are easily recognized, its haustrations imparting a characteristic wavy outline to the gas shadow. These haustrations only partially cross the gas filled colon at irregular intervals, and this enables them to be distinguished from the shadow cast by the valvulæ conniventes of the jejunum. The coarse wavy outline effect produced by the haustrations of the colon should be distinguished from the fine wavy outline of the jejunum. The pelvic colon often forms an important exception: when it distends, the wavy outline is lost, and it often appears as a loop of gas-filled bowel with regular outline. The difficulty in diagnosing such a loop from distended ileum is further increased by the fact that in many cases of low obstruction the descending colon does not dilate to the same extent as the remainder of the colon, and continuity with the pelvic loop is consequently more difficult to trace. Thus, there is a tendency to place the site of obstruction at too high a level in the colon. It should be noted that, apart from cases of volvulus of the colon, distension in the colon is always maximal in the caecum, no matter how distal the site of obstruction in the colon. In addition, the right half of the colon as a whole tends to dilate to a greater extent than does the left half of the colon.

In general, distended loops of colon are located at the lateral borders of the abdomen, and their long axis is usually vertical, in contrast to the transverse axis of distended loops of small bowel.

Gas Shadows in Conditions other than Obstruction.—Gas shadows are scattered throughout small bowel and colon in cases of renal colic, gastro-enteritis, pneumonia and uræmia. These may cause confusion in diagnosis.

Normal Fluid Levels.—In normal persons, fluid levels occur regularly at the following specific sites, and the appearance of a fluid level at any of these points must be regarded as physiological. (i) A long fluid level surmounted by a large gas bubble is commonly seen in the stomach. (ii) A smaller and less definite fluid level is sometimes seen in the duodenal cap. (iii) A small fluid level is seen rarely in the terminal ileum. (iv) In children less than three years of age, fluid levels in the small bowel are a normal occurrence.

Fluid Levels in Intestinal Obstruction.—The number of fluid levels formed is proportional to the degree of obstruction and to the site of obstruction in the small bowel. The nearer the site of obstruction is to the ileo-caecal valve, the greater is the number of fluid levels formed. The number and size of the fluid levels often form a useful index of the severity of the condition. When the colon is obstructed, especially if it is short and without sagging loops, there may be only one or two levels. However, if the ileo-caecal valve is incompetent, the small bowel may be distended to a degree overshadowing the colon and may contain many fluid levels. This may lead to confusion in diagnosis, a colonic obstruction being thought to be a small bowel obstruction. The length of fluid levels sometimes indicates the portion of the bowel in which they lie, the longest being in the colon, especially a volvulus of the sigmoid colon. The position of the fluid levels may help to localize the site of the obstruction: in jejunal obstruction, the fluid levels lie in the left upper part of the abdomen; in ileal obstruction in the middle and right side of the abdomen. Fluid levels rarely form in a strangulated loop, since it rarely contains any gas. One exception is the volvulus of the sigmoid colon already referred to.

Fluid Levels in Conditions other than Obstruction.—Fluid levels in the following conditions may lead to a false diagnosis of obstruction: (i) The commonest cause of false fluid levels is the incomplete evacuation of a watery enema which has been administered before the X-ray examination. However, in such a case the colon is not distended. (ii) Small fluid levels are seen in the

small bowel in cases of gastro-enteritis. (iii) Numerous small fluid levels occur in peritoneal carcinomatosis, peritonitis and mesenteric vascular occlusions. (iv) Subphrenic abscesses may be associated with an abnormal fluid level. If on the left side, the gas bubble in the stomach may cause confusion.

Diagnosis and Localization of Obstruction.

Small bowel obstruction may be diagnosed by (*a*) the presence of distended loops of small bowel with fluid levels present in the erect and lateral films; (*b*) the absence of gas in the large bowel, especially the caecum. The number, size and location of the fluid levels may indicate the level of the obstruction as indicated earlier. A faint shadow of the gall stone, and gas in the biliary tree may be seen in cases of gall-stone ileus. Large bowel obstruction may be diagnosed by the presence of gaseous distension of the colon. When the obstruction occurs in a part of the colon which has a mesentery, the tendency is for the dilated loops to ride up in the abdomen, with the result that the true site of obstruction is not diagnosed. The common error, as has been pointed out, is to place the site of the obstruction at too high a level in the colon. If there is genuine doubt, after clinical examination and a study of the skiagrams, further X-ray pictures taken in three to four hours will often clarify the diagnosis.

Enema Preliminary to X-ray Examination of Abdomen.

Aird (1950) points out that the gas normally present in the colon can be evacuated by enemata. He states that if gas is visible on the skiagram in any part of the colon after diagnostic enemata a colonic obstruction is evident. Other authorities (Chesterman, 1945; R. Smith, 1948) state that the giving of an enema may make the interpretation of a later X-ray picture difficult. Retention of the enema causes fluid levels to appear in the colon, and although they are not associated with gas distension they may lead to a false diagnosis of obstruction. It is the author's experience that an enema does not cause confusion in the interpretation of subsequent X-ray pictures, provided that one is aware that it has been given.

In summarizing the value of radiology as a diagnostic help, let us say (*a*) that time should not be wasted taking X-ray pictures if the diagnosis is already clear; (*b*) that they should never be omitted if some non-operative plan is contemplated; (*c*) that they are of extreme value if there is doubt as to the necessity and urgency of surgery.

CHOICE OF TREATMENT.

Aird (1949) states:

> There are three measures available for the treatment of intestinal obstruction—gastro-duodenal suction, intravenous fluid administration and operative correction. Given early diagnosis, success in treatment depends upon the prompt commencement, the efficient management and the adequate continuation of the first two of these, and the choice of a proper moment for the third.

At this juncture, the discussion will be confined to suction decompression and operative intervention, while intravenous therapy will be discussed later in a separate section.

Thirty years ago, the diagnosis of acute intestinal obstruction meant immediate operation. In the 1930's, the pioneering efforts of Wangensteen on intestinal suction caused a swing of the pendulum in favour of non-operative treatment. Nowadays, the pendulum is swinging back. While few surgeons would deny the extreme value of suction decompression and resuscitation as a pre-operative measure, they are less impressed with their value as definitive measures. In other words, early operation after a short trial period of conservative measures is once again becoming the method of choice. Extreme judgement is required in the choice of the correct time to operate in those cases in which operation is indicated. It should be realized that faulty choice of treatment as well as of execution may precipitate a fatal result. Thus there is a mortality of treatment as well as of disease, and all efforts should be directed towards reducing the former to a minimum.

Suction Decompression.

Indications.

Suction decompression finds its most useful place in the early post-operative period for the prophylaxis and treatment of functional obstructions. It is more effective in preventing distension than in contending with the problem after the establishment of distension. Since its introduction, acute dilatation of the stomach has become extremely rare, and now occurs as an unexpected complication from an extraabdominal cause. Similarly, paralytic ileus, occurring either post-operatively or as a result of uræmia, severe fractures, retroperitoneal hæmorrhage or pneumonia, usually responds to suction and intravenous therapy. Diffuse peritonitis, either after surgery or where surgery is contraindicated, requires suction decompression in addition to resuscitation and antibiotics. Adhesive small bowel obstructions, when the distension is not great and the obstruction is incomplete, may well be treated definitively by suction decompression. He who elects to treat a patient thus must follow the decompression by repeated X-ray examinations and by repeated clinical observation. In the author's experience, it has been used most often for the patients with recurrent mild incomplete obstructions who frequently require hospitalization, but rarely operation.

Contraindications.

There are two absolute contraindications to the employment of suction as the sole remedial agent—namely, strangulating obstruction and acute obstruction of the colon with great distension. One of the problems associated with the use of decompression is that we can rarely be absolutely sure that a strangulating obstruction is not present and, if the method is used extensively, lives will be lost because of incorrect diagnosis. If there is gross distension in association with large bowel obstruction, the patient often has a competent ileo-caecal valve. This converts the obstruction into a closed loop type involving the proximal colon. Unless operation is performed rapidly, the caecum may perforate with fatal consequences.

Technical Problems.

If one decides to use suction decompression in a given case, the choice lies between employing suction to an indwelling gastric tube and to an indwelling intestinal tube. When the method was first introduced by Wangensteen, a single-lumen intragastric tube was used. A few years later, a double-lumened tube was employed by Miller and Abbott mainly for research into intestinal function. Thereafter, a double-lumened tube was used commonly for intestinal suction in the treatment of intestinal obstruction. However, this brought further technical problems. It was difficult to persuade the tube to pass the pylorus and enter the small intestine, and many different types of tubes and many ingenious methods were employed to achieve this purpose. The addition of mercury, positioning of the patient, and magnetism were all tried without general success. Very recently Grafton Smith (1952) of Wangensteen's clinic produced a flexible stylet with a controllable tip. With this instrument, under radiological control, an intestinal tube may be passed into the duodenum in many cases in a matter of minutes. However, it is disappointing that, in a significant proportion of cases, the tube will not pass the duodeno-jejunal flexure.

Most experienced surgeons will agree that, if the intestinal tube enters the small intestine, and suction is properly managed, decompression will be more rapid and effective than with an intragastric tube. However, even with the use of the Grafton Smith stylet, the introduction of the tube into the intestine may be time consuming and not very pleasant for a sick and often exhausted patient. There is no doubt in the author's mind that if the surgeon and nursing staff are trained and enthusiastic about this method, it will produce good results. Close cooperation with the X-ray department is essential. The method is best suited for special clinics

interested in the problem, as the staff, surgical and radiological, in a busy general hospital often find it difficult to make the time available to carry out the instrumentation under X-ray control.

Certainly, in a reasonable proportion of cases, a Miller-Abbott tube will pass the pylorus in an acceptable time with the following technique: Introduce the tube through the nose into the stomach. Blow up the bag with air and then pull back the tube until it impinges on the cardia. Then empty the bag of air, and insert two millilitres of mercury into it. Inflate the stomach with 100 cubic centimetres of air, lie the patient on his right side and slowly introduce the tube about one inch every five minutes for 15 minutes. Usually the end of the tube now lies pointing towards the pylorus. Leave the patient in this position and introduce one inch every 15 minutes. An X-ray picture taken in half to one hour will often demonstrate that the tube has passed the pylorus. It is unfortunate that the tube is often hardest to pass in patients who are grossly distended and who need it most.

Once the intestinal tube has passed there are further problems to be overcome. It is extremely galling for the tube to have passed into the small intestine and yet not decompress it. The tube may become blocked by thick aspirations or by the indrawing of mucosa into the holes. The tube should be cleared every hour by syringing down it 30 millilitres of saline. (Injections of neomycin down the tube have been suggested.) Continuous suction, preferably by Wangensteen's bottles or alternatively by a weak motor sucker, is superior to intermittent suction. It gets rid of the gas in the intestine, which causes as much distension as the fluid content. Sometimes the tube decompresses the intestine satisfactorily as it descends, but the patient vomits when the stomach and proximal intestine distend again. In such a case, a duodenal tube is necessary in addition to the intestinal tube.

Therefore, it is not difficult to understand that an intestinal tube requires the expert attention of enthusiasts if it is to function properly. An intestinal tube is not without dangers: it may cause œdema of the larynx, mastoiditis, œsophagitis and later stricture; it may knot in the stomach or intestine and be impossible to withdraw. In addition, it may cause perforation of the intestine. Polythene or other plastic material is less irritating than rubber, and will probably replace it in the years to come.

To sum up, most surgeons, except those in special clinics, are satisfied with continuous or intermittent suction to an indwelling gastric tube. They use an intestinal tube and continuous suction only in particular cases, where it is especially indicated. If the facilities are available (that is, a Grafton Smith stylet and a skilled anæsthetist), great benefit will ensue if an intestinal tube is passed immediately pre-operatively or actually during the operation. In such a way, distension may be aseptically controlled and operation made safer.

Use and Misuse of Suction Decompression.

Ideally, one would think that all simple occlusions of the small intestine and all functional obstructions could be treated adequately by suction and without operation. However, diagnosis is not sufficiently accurate to allow such a clear-cut plan. In some cases of simple occlusion it is impossible to exclude absolutely the possibility of strangulation, and, if there is the slightest doubt, immediate operation is necessary. In cases in which there has been no suspicion of strangulation, the surgeon may be surprised and horrified to find gangrenous gut when the abdomen is eventually opened. Similarly, functional obstructions which persist in spite of conservative measures often merge into mechanical obstructions and require operation for their relief. It is reasonable to treat a mechanical obstruction with a short period of suction and intravenous therapy, and plan to operate when the patient's condition has improved. If the relief of distension by suction also relieves the obstruction and operation proves to be unnecessary, everyone is delighted. This is very different from setting out to treat obstructions definitively by suction with the intention of avoiding operation altogether.

Repeated clinical and radiological examinations are essential while a patient is being treated by conservative measures. The following are the signs of successful decompression: (*a*) cessation of colic; (*b*) decrease in distension; (*c*) X-ray evidence of the onward passage of gas; (*d*) reduction in the amount of aspirations; (*e*) tolerance of temporary discontinuance of suction without recurrence of pain.

It should be noted that suction and intravenous therapy will often cause a cessation of pain and a marked improvement in general condition, even in patients with strangulation. For this reason, all cases must be subject to the closest scrutiny. Operation should be considered if distension is not reduced or actually increases or if an intestinal tube does not descend well into the small intestine and show signs of relieving the obstruction within twelve hours. Today, there is far less tendency to persist with conservative measures than was customary a decade ago. Undoubtedly, procrastination until operation is too late to be effective, is an important factor in the mortality figures. Wangensteen (1955) states:

> During recent years the tendency in the management of cases with great distension which respond slowly to conservative means of decompression has been to veer away from protracted efforts at achieving decompression in this manner. Timely and well executed surgery holds out less risk for these patients. Suction has taught that decompression without spillage is synonymous with success. The surgeon must learn also how to achieve decompression without spillage in those cases in which operation is mandatory.

Suction decompression as a definitive measure has the following limitations: (*a*) the method is not always effective; (*b*) it is frequently slow in achieving decompression, threatening the safety of the patient and disturbing the equanimity of the surgeon; (*c*) it may be inadvertently applied to patients with strangulation, in whom immediate operation is always essential.

In summary, the author agrees with Grafton Smith (1955) who, after reviewing 1252 cases, makes the following suggestions for treatment. A twelve-hour trial of intestinal suction is warranted in small-bowel obstructions without signs of strangulation. When active peristalsis is present the chances for decompression are greatly improved. On the other hand, the atonic bowel of late mechanical obstructions usually thwarts all non-operative attempts at decompression, and patients in this category are best operated upon soon after adequate supportive therapy. Patients treated by suction are reevaluated at the end of a twelve-hour period by X-ray examination of the abdomen. If there has been a significant reduction in the degree of distension and clinical improvement is progressive, suction is continued. However, the development of any signs or symptoms suggesting strangulation, obstruction or failure to relieve distension is an indication for the interruption of suction treatment by surgery. Remember that it is a crime to allow a patient to die of mechanical obstruction without a scar on his belly.

Surgical Procedures.

The important therapeutic consideration in bowel obstruction is to achieve decompression of the distended intestine before the high intraluminary pressure has led to impaired viability of the bowel wall. This complication is usually characterized by abnormal permeability of the bowel wall and later peritonitis. Although suction may make the need for surgical intervention less urgent, in many cases operative release of the obstructing agent is necessary to relieve this increased intraluminary pressure. The main cause of difficulty in operating on patients with acute intestinal obstruction is the distension. Immediate surgery would not be so hazardous if large distended coils of bowel did not eviscerate and hinder the surgeon. Later in the essay the problems peculiar to this distension will be discussed in detail.

That an adhesive band may cut deeply into the bowel wall when an obstruction has been present for several days is not well known. At operation, it may be found that the entire circumference of the obstructed bowel save its mesentery may be divided by such a band,

the edges of the gut being held together only loosely by fibrin. Whereas an obstructed loop does not often rupture spontaneously, the slightest manipulation at operation frequently results in the accidental opening of the bowel with the escape of its highly infective contents into the peritoneal cavity. The surgeon should be aware of this possibility and proceed with the greatest gentleness.

The absolute indications for surgery in acute intestinal obstruction have been noted in the foregoing—namely (*a*) strangulating obstructions and (*b*) large bowel obstructions with considerable distension. To this we may add the relative indication of failure to respond to conservative measures. We have already stressed the fact that one should not delay too long with conservatism unless there is evidence that the obstruction is relenting. Once operation is decided upon, one is faced with the problems of (*a*) the preparation of the patient; (*b*) the anæsthesia; (*c*) the choice of operative procedure. The latter will include a discussion on technical faults and how to avoid them.

Preparation of the Patient.

Preparation implies (i) continuous suction as outlined earlier and (ii) resuscitation by intravenous therapy, which will be discussed later. Suffice it to say that few patients should be taken to the theatre without a duodenal or intestinal tube in place and fluid running into the veins. Operation is usually postponed until the patient's general condition has improved.

Anæsthetic Problems.

Local anæsthesia (Molphy, 1957) is used only if the general condition is too poor to stand any other anæsthetic. It is principally used for the performance of blind caecostomy under desperate circumstances or for the relief of strangulated external herniæ. Many lives have been saved by its intelligent use. In general, however, general anæsthesia is to be preferred. Whatever anæsthetic is given, there must be adequate relaxation. This is particularly important at the time of closing the abdomen to allow proper suturing and to prevent a "burst abdomen".

The most serious complication of any form of general anæsthesia is the inhalation of intestinal contents, which usually occurs during the induction phase. This can usually be avoided by the careful aspiration of the indwelling intragastric tube immediately prior to the induction of anæsthesia. Failure to do this has adversely affected the prognosis in the past. A sucker must be handy, and someone available to tip the table head down without delay should these precautions against regurgitation fail. A cuffed endotracheal tube should be rapidly introduced. This will prevent inhalation of intestinal contents during the maintenance of anæsthesia and will allow the anæsthetist full control over the airway and the respiratory exchange.

The choice of anæsthetic is second in importance only to the choice of anæsthetist. A trained anæsthetist is essential for these cases otherwise the prognosis will be adversely affected. Dr. Molphy (1957) states:

> My personal preference is a moderate dose of pethidine, a sleep dose of thiopentone, succinylcholine, introduction of the endotrachial tube and the use of nitrous oxide. Maintain the relaxation with succinylcholine or tubarine. It is important that the anæsthetist has the patient well oxygenated before inducing anæsthesia by having him breathe oxygen for several minutes, whatever drug is being used.

There is no doubt in any surgeon's mind that the use of relaxants has been of immense assistance in preventing the evisceration of unruly coils of distended bowel. Undoubtedly, improvements in anæsthesia and especially the use of relaxants have been an important factor in the reduction of mortality in those cases of obstruction in which surgical treatment is undertaken.

Some authorities still favour spinal anæsthesia, but in the author's opinion this should be used only when no trained anæsthetist is available to give a "combined anæsthetic", as outlined in the foregoing. Spinal anæsthesia has the following disadvantages: (i) a distended patient lying flat on his back can still drown from a big vomit even though he has the power to close his larynx; (ii) a grossly distended patient may become severely anoxic, if his intercostal muscles are paralysed; (iii) a patient under spinal anæsthesia will still be distressed if there is much drag on the mesentery during the operation; (iv) such patients often suffer an uncontrollable fall in blood pressure; (v) the spinal anæsthetic may not "take", and supplementing it may be lethal.

Cardiac arrest may follow the sudden delivery of the dilated gut from the peritoneal cavity, but the mechanism of this is not clear. The usual methods of dealing with this major catastrophe should be carried out without delay.

A fall of blood pressure usually occurs if the heavy dilated loops of gut are allowed to become dependent over the side of the abdomen. The surgeon should prevent this drag on the mesentery.

Gross distension can cause serious respiratory distress in a patient with pre-existing decreased respiratory reserve. The period of danger is in the immediate post-operative period while the patient is still a little depressed by the anæsthetic drugs, but does not have any artificial aid to respiration. Therefore oxygen should be administered to such a patient during this period.

It has been found that some elderly patients suffering from advanced intestinal obstruction are resistant to the anticurare effects of "Prostigmin", and this prolonged period of muscular paralysis has resulted in some early post-operative deaths. This neostigmine-resistant curarization has been thought to be related to an electrolyte imbalance and perhaps to a low serum potassium level. At the end of the operation, the patient should be turned on his side before the endotracheal tube is removed. He should remain on his side until full consciousness is regained.

Choice of Operative Procedure.

Operation should be performed with the primary object of saving life by the simplest procedure consistent with ultimate recovery. The policy should be to avoid major procedures in these sick patients, and rather to defer them to a later period when the patient is fitter. Study of the statistics has shown that how a procedure is carried out is quite as important as what is done. In that regard, the following principles need attention. First, make an incision adequate in length. In general, a paramedian incision should be used unless the diagnosis is absolutely without doubt. For one thing, it is easier and quicker, and for another, it may readily be enlarged. Be gentle but quick. These measures will reduce shock and may mean the difference between life and death in advanced cases. If possible, avoid extensive manipulations of the distended friable intestine. It has been shown that adhesions may cut deeply into the bowel wall and, in advanced cases, however gentle one is, manipulation may lead to spill. Experienced surgeons may foresee this and decide to aspirate the bowel first with a needle or to perform an enterostomy. As has been pointed out earlier, distension is the main cause of difficulty. If an intestinal tube is in place, the intestine may be safely decompressed by suction. If not, and the obstruction is not immediately obvious, then operative aseptic decompression is necessary. This will be described under the heading "Distension".

If, even with the above-mentioned measures, one is still in difficulty, there should be no hesitation in allowing the intestines to eviscerate, provided they are kept warm and there is no drag on the mesentery. It is not always essential to discover the obstructing agent except in the presence of strangulation. In such an event, the constricting agent must be dealt with at the time of operation, and the liberated segment of bowel critically inspected for viability. After the obstruction has been relieved, stripping of the bowel in an attempt to reduce distension is hazardous and should be condemned.

Division of Adhesive Bands.

Every surgeon hopes when he is dealing with a case of obstruction that the cause is a single adhesive band. This

may be divided readily, and the whole procedure is completed within twenty minutes. Unfortunately, they are not all as easy as this. There may be more than one band, and each needs to be divided, otherwise the obstruction will recur. One occasionally sees a case in which there is recurrent obstruction, and operation reveals an entangled mass of adhesions. It may be impossible to tell proximal from distal bowel. Such patients are among the most difficult to treat. If one attempts to disentagle the adhesions, the bowel will almost certainly be torn. A short-circuit operation may be a solution to the problem. However, obstruction has been known to recur even after this. The author had one such patient recently who underwent four laparotomies within about six weeks. The author was called in for the last operation and resected the adhesive mass and performed immediate anastomosis, with satisfactory result. Perhaps Noble's plication operation has a place in such cases.

Proximal Colostomy or Caecostomy.

Proximal drainage above an obstruction in the large bowel is still the safest method of treatment. "Blind" colostomy without abdominal exploration is indicated only when the diagnosis is absolutely certain, or when the patient's condition or the surgeon's skill is in doubt.

Whether a colostomy or caecostomy is performed depends in part on the surgeon's preference. There have been many case reports extolling the virtues and condemning the faults of each. While the author still performs an occasional caecostomy, he favours colostomy when he has a choice. Caecostomy contents are irritating to the skin, and a caecostomy may not decompress the colon adequately. To obviate this, it is necessary to irrigate the caecostomy every hour to prevent blockage. Even so, it is difficult to clean adequately the distal colon prior to the second stage resection. However, caecostomy is indicated when a colostomy is impossible, because of obesity or short mesocolon, or when the growth is in the right side of the colon (excluding the caecum), and yet ileo-transverse anastomosis or primary resection is not indicated.

A colostomy is not an easy operation in a distended patient. The bowel may need to be aspirated aseptically before a colostomy is possible. In the author's experience, Devine's colostomy is absolutely contraindicated because it is time-consuming and difficult, and is probably unsafe in all patients with distended bowel. A loop colostomy is best, and preferably should be situated in a different quadrant from the growth. For example, a right transverse colostomy is performed for a growth in the left colon. Recently, there have been advocates for placing the colostomy immediately proximal to the site of the obstruction. By this means, it is said that washouts are easier, and the colostomy can be resected with the growth at the second operation. This reduces the number of staged operations from three to two. However, the author believes it is not always easy and is often messy to include the colostomy with the resection. None the less, it is a good alternative to keep in mind. When performing a colostomy, it is desirable to suture the peritoneum to the colostomy or to the mesocolon in order to prevent prolapse of the small bowel alongside the colostomy. A useful technical point is to suture the glass rod to the skin. This will prevent both retraction and prolapse of the colostomy—serious complications in the early stage.

Obstructive Resections (Paul-Mikulicz).

Obstructive resections are not very fashionable nowadays in neoplastic obstructions, mainly because of the difficulty of performing a wide excision of growth and regional lymph nodes when the bowel is distended. However, the procedure is useful in occasional cases in which the mesocolon is fully mobile and there is no technical barrier to radical excision. A Paul-Mikulicz resection is particularly indicated when gangrene of the large bowel is present in addition to obstruction. This may occur in volvulus of the sigmoid colon or ileo-caecal region. Likewise a perforated carcinoma may be exteriorized and resected if only as a palliative measure.

Primary Resection with Anastomosis.

There is an absolute indication for this procedure—namely gangrene of the small intestine associated with obstruction whether it be due to bands, external hernia or mesenteric vascular occlusion. The only alternative would be exteriorization of the resected small bowel, and this is rarely indicated. In the large intestinal obstructions, the emphasis is in the other direction. As pointed out earlier, in general, proximal colostomy or caecostomy, or else a Paul-Mikulicz procedure, is advocated. However, if conditions are satisfactory and the patient is reasonably fit, primary right hemicolectomy with immediate anastomosis may be performed for acute obstruction of the right side of the colon. In such a case, Muir (1947) believes that a tube, passing from the transverse colon through the anastomosis to the ileum and draining to the exterior, may make the procedure safer. In the author's opinion, primary resection with anastomosis for obstruction caused by a carcinoma of the left side of the colon is absolutely contraindicated. Wangensteen (1955) has abandoned the procedure because of the increased mortality.

Short-Circuit Operations.

In general, short-circuit operations are reserved for those cases in which the bowel is viable, and in which the obstruction is either removable or else its removal should be left to a more opportune time. Entero-enterostomy has been mentioned as an alternative procedure when there are matted adhesions impossible to unravel in the presence of obstruction because of the risk of perforation of the bowel. Neoplastic or inflammatory masses in the ileo-caecal region causing acute obstruction are often best treated initially by performing an ileo-transverse colostomy. If the lesion is resectable, this may be performed at a second stage, while if it is not removable, the short-circuit has provided satisfactory palliation. Certain patients with pelvic plastic peritonitis with low ileal obstruction are still best treated by anastomosis of the ileum to the transverse colon, although the indications are rare today. It should be noted that there is a risk of anæmia and diarrhœa developing after an entero-anastomosis. In such a case, the anastomosis may have to be undone at a later date when the patient's condition has improved.

Enterostomy.

Enterostomy was more frequently performed in the days before the introduction of suction decompression. Nowadays, it is rarely indicated but, if performed in some cases of insuperable difficulty, an occasional life will be saved. Such a case is one of adhesive obstruction of several days' duration in which deliberate pursuit and division of adhesions are particularly liable to lead to trouble, such as rupture of the bowel and peritonitis. A quick enterostomy (of the Witzel type) may save the day, and the patient may survive long enough for definitive surgery to be performed.

Technical Faults.

Faulty judgement in deciding what to do and faulty surgical technique are important factors in high mortality still associated with the treatment of acute intestinal obstruction. It takes considerable experience to know when to aspirate the bowel before exploring the abdomen, when to be content with an enterostomy, when adhesions are too dense to be divided with safety, and when a primary anastomosis may be performed in place of an exteriorization operation. One of the most serious technical risks of operation is that of spilling some of the highly infective contents of the bowel. Gentleness is the keynote to success in handling the distended coils of bowel. The method recommended for decompressing the bowel at operation without soiling will be discussed later under the heading of "Distension". If dubiously viable bowel is left and not resected, two serious consequences may ensue. One is that the loop may become gangrenous and rupture, leading to a fatal peritonitis. The other is that the bowel may fibrose and cause a stricture which results in a mechanical obstruction at a later date.

Mention must be made of a few of the technical points in anastomosis. Most surgeons, other than Americans, prefer an open technique to a closed "aseptic" technique. They believe there is no more risk of peritonitis, that the sutures can be placed more accurately and that there is less risk of mucosa being so far inverted as to cause obstruction. An important technical point is that detachment of the mesentery to a point half a centimetre beyond the site of application of a clamp is perfectly safe if an oblique end-to-end anastomosis is being performed. This manœuvre permits placement of every suture in the bowel wall. Whenever possible, the opening in the mesentery must be closed to prevent post-operative herniation.

Intravenous Therapy.

Over the last decade, considerable progress has been made in understanding the fluid and electrolyte requirements of the patient. It should be realized that unless the supportive treatment is carefully prescribed with regard to the amount of fluid and its type the prognosis will be seriously affected. Let us consider the basic fluid requirements in an uncomplicated case. Most authorities agree that 3000 millilitres of fluid are required per 24 hours. This must include 4·5 grammes of salt and four to six grammes of potassium.

If a case of intestinal obstruction has clinical signs of dehydration, almost certainly there is a deficit of at least four litres of fluid, and the deficiency will include sodium, chloride and potassium (Aird, 1949). Preferably, an estimation of the serum electrolyte levels should be performed, so that adequate replacement of the fluid and electrolytes may be assured. In general, the water and salt deficit should be replaced before potassium is given. This enables the kidneys to resume their function and reduces the risk of potassium administration. Replacement of the fluid and electrolytes will often unmask an anæmia, which may require correction with blood transfusion. The period of treatment by suction decompression is an ideal one for the replacement of fluids and electrolytes, whether the patient is to be treated by operation or by conservative measures. It must also be emphasized that continuous suction decompression without adequate concomitant intravenous therapy is positively dangerous. A good general principle is to replace abnormal losses (for example, by vomiting, aspirations or fistulæ) volume for volume with normal saline, over and above the basic requirements already outlined. By application of the above regime, the author has found that severe electrolyte imbalance during treatment is unusual.

Potassium Therapy.

The great importance of the potassium ion in abdominal surgery has only recently been realized. The introduction of the flame photometer into clinical work has enabled estimations of the electrolyte levels to be performed rapidly enough to be of clinical value. Previously, in most hospitals, the delay was too great for other than research projects. Streeton and Ward-McQuaid (1952) have suggested that a low serum potassium level may be a factor in the ætiology of paralytic ileus. Certainly the author has found that persistent distension after operative treatment of intestinal obstruction is often associated with a low serum potassium level and may respond to parenteral potassium.

A clinical diagnosis of potassium deficiency may often be made if the condition is kept in mind. Abdominal distension amounting to a chronic ileus has been mentioned. The patient often is very lethargic and apathetic, with associated muscular hypotonus and diminished tendon reflexes. The diagnosis is confirmed by characteristic electrocardiographic changes—namely depression of the *S-T* segment, lowering, widening or inversion of the *T* waves, prolongation of the *Q-T* interval and appearance of *U* waves. The normal serum potassium level is 3·9 to 5·2 milliequivalents per litre. A figure below 3·7 milliequivalents per litre is diagnostic of potassium deficiency.

Naturally enough, any potassium deficiency is best corrected orally, but, in cases of obstruction, this is rarely possible. Certain definite precautions must be taken when potassium is given intravenously, otherwise the plasma potassium concentration may reach dangerous levels, and cause serious derangements of cardiac function (Le Quesne, 1954). It should not be given intravenously unless there is a good urinary output, and it must be given with great care to patients known to have depressed renal function. The concentration of potassium in the fluid used should not exceed 40 milliequivalents per litre; the rate of administration should not exceed 20 milliequivalents per hour, and the total dose should not exceed 100 milliequivalents in a twenty-four-hour period.

In practice, the author has found that two grammes of potassium chloride may be safely given with 500 millilitres of intravenous repair solution (either 5% glucose in water, normal saline, or 3·3% glucose in 0·3% saline). Warning should be given against the administration of concentrated potassium either intravenously or subcutaneously.

Provided the renal function is adequate, there is little likelihood of a dangerous rise in the plasma potassium level. However, the serum potassium level may rise above normal in the early post-operative period, when there is a temporary oliguria, and then fall to significantly low levels when diuresis occurs. This illustrates the necessity for full clinical assessment of the patient, rather than prescribing the intravenous therapy solely from laboratory results. It should be realized that the earliest signs of cardiac derangement are seen when the plasma potassium concentration rises above 7·0 milliequivalents per litre, and death occurs when the level is 14 to 15 milliequivalents per litre.

Subcutaneous Therapy.

It is worth mentioning that, in the maintenance phase after operation, fluid may be given by subcutaneous infusion when it cannot be given by mouth and intravenous therapy is not indicated. The advent of "Hyalase" has made this old-established method popular again. To each 500 millilitres of fluid one millilitre of "Hyalase" solution is added, which hastens the absorption. However, blood, albumin and potassium should not be given subcutaneously. The fluid can be run in over six hours and the drip removed, allowing uninterrupted rest for the remainder of the day.

Antibiotics.

Recent reports (Cohn, 1956) of the protective influence of antibiotics in animals with strangulation obstruction merit consideration. Unfortunately, there are no reliable statistics which have shown conclusively that they exert a similar favourable effect on the course of acute intestinal obstruction in man. To date, the results have been disappointing in the treatment of peritoneal soiling, particularly diffuse peritonitis and perforation. In practice, the author recommends the exhibition of antibiotics to prevent or treat respiratory complications. In addition, they should be given in cases of strangulation, or where soiling has occurred. This spillage is best prevented by means outlined elsewhere, but, if it occurs, the author feels that antibiotics will certainly do no harm and may possibly save an occasional patient. The choice of antibiotics lies in the combination of sulphadiazine, penicillin and streptomycin, or alternatively the exhibition of one of the broader spectrum antibiotics, such as "Achromycin", given by intramuscular injection.

There is no doubt that the problems of obstruction would not be so great if the bacterial flora of the bowel could be greatly reduced. Grafton Smith (1955) suggests the following antibiotic regime: (*a*) prophylactic penicillin and streptomycin should be given to all patients with intestinal obstruction; (*b*) neomycin should be injected through a long intestinal tube, after decompression of the proximal bowel but before intestinal resection; (*c*) neomycin in an isotonic solution may be added to the irrigating solutions used to clear intestinal tubes, particularly in the early post-operative period.

Inhalation of Oxygen.

Inhalation of a high percentage of oxygen is alleged to be of value in cases of advanced obstruction with gross distension, by facilitating the absorption of gases from

the lumen of the gut. The necessarily high concentration may, however, cause pulmonary œdema. In practice, it is recommended that oxygen be administered to these patients, but not in dangerous concentrations; at least it will provide adequate oxygenation of the lungs for patients with marked distension.

DISTENSION.

Distension exerts its most important lethal effect upon the bowel wall, although gross distension may embarrrass respiration and heart action by pressure on the diaphragm. The intraluminary pressure leads to an impaired viability and permeability of the bowel wall. This effect may be so great as to cause intramural gangrene. The author has seen a case of gangrene of the entire colon proximal to an obstruction in the recto-sigmoid junction. Therefore, the reduction of intraenteric pressure by suction decompression or by operative means is an urgent matter, to avoid impairing the viability of the bowel and to prevent the permeation of the gut wall by bacteria. Measures to reduce the distension before, during and after operation will improve the prognosis.

Before Operation.

Measures before operation have been dealt with adequately in the earlier part of the essay, when the problem of suction decompression was discussed.

At Operation.

Distension affects the prognosis adversely because of the technical difficulties it creates at operation. Improvement in the mortality figures will occur only when the surgeon learns how to decompress the distended bowel at operation without soiling the peritoneum. If an intestinal tube is in place, the distended intestine may be readily and safely decompressed by suction through it. If the surgeon and his assistants are skilled in the introduction of an intestinal tube, using the Grafton-Smith stylet, this method is of value. Within a few minutes a tube can be helped down into the small intestine, which is then safely decompressed. If these two possibilities are not carried out, the surgeon has recourse to the "aspetic decompressive suction enterostomy" of Wangensteen. This will reduce the distension and enable the surgeon to see and deal, intelligently and effectually, with the obstructing agency.

The main points of this procedure are as follows: A distended segment of small bowel is emptied by "milking", and rubber covered clamps are applied at each end. After a purse-string is placed, a trocar is inserted into the bowel. A catheter with multiple perforations is then inserted through the trocar into the bowel. Soiling is prevented by protection of the plunger shaft and catheter with Penrose drains lubricated with glycerine. Suction is applied to the end of the catheter and the entire small bowel gently decompressed. When decompression is complete, the trocar and catheter are aseptically withdrawn and the defect closed transversely in two layers. Rarely is enterostomy necessary after this procedure now that post-operative decompression through a tube is commonly employed.

After Operation.

If an intestinal tube is in place, it should be left there and continuous suction applied. The avoidance of distension in convalescence will materially lessen the tendency to early mechanical post-operative obstruction. Suction should be continued until the patient passes flatus regularly. The presence of a duodenal or intestinal tube is an essential safety precaution after resection of bowel.

STRANGULATION.

Strangulating intestinal obstructions, especially those with gangrene of the bowel, carry a worse prognosis than simple occlusive obstructions. Delay in diagnosis and delay in operative treatment are potent factors causing a mortality in the vicinity of 30% (Wangensteen). Every surgeon agrees that operation is urgently necessary when strangulation is present. So the main cause of delay is difficulty in diagnosis. Unfortunately, there are no absolutely reliable signs by which to distinguish strangulating and simple obstructions. The history is often one of sudden onset in strangulation, whereas it is more gradual in simple occlusions. The following clinical features often suggest strangulation.

Clinical Features.

Pain.

In general, the intestinal colic is more violent, lasts longer and recurs more frequently. There is an incomplete disappearance of the pain between cramps. Sometimes pain occurs in the back due to a stretching of the mesentery. Usually the pain will not completely disappear after the institution of gastro-intestinal suction, but sometimes it does, and therein lies the danger of long-continued suction decompression. The pain may be so agonizing that the patient becomes hysterical. On more than one occasion, the author has been asked to transfer a noisy patient from the surgical ward to the psychiatric department, only to find the patient has a strangulating obstruction. Patients with strangulating obstructions often cannot find a comfortable position, and turn from side to side, while those with a simple obstruction are more content to lie supine.

Vomiting.

Vomiting usually appears at the onset of strangulation, and is severe and recurrent. If a tube is in place, persistent fæculent aspirations are a grave sign and suggest strangulation, even though the pain may have been relieved by the suction.

Constitutional Signs.

Reinus (1951) reports that a temperature greater than 101°F. occurs in only 1% of simple obstructions, but is present in 50% of strangulating obstructions; that a pulse rate greater than 110 per minute occurs in 1% of simple obstructions and 75% of strangulating obstructions. In the author's experience, these signs are of help only if taken in conjunction with the general clinical picture. Persistent tachycardia greater than 100 per minute has been found by the author to be a valuable sign, either that the obstruction is not relenting, or, alternatively, that there is an element of strangulation. Some degree of surgical shock is often present, and is almost certainly related to the loss of blood into the strangulated loop. As a general rule, the shock is not completely relieved by resuscitation. However, intravenous therapy and suction decompression may so improve the patient that it is extremely difficult to differentiate a simple from a strangulating obstruction. Leucocytosis was previously thought to be of distinguishing value. However, Becker (1952) showed that, in a series of 412 patients, 60% of patients who died of strangulating obstructions had a normal leucocyte value. That the leucocyte count is not of value in differentiatial diagnosis is confirmed by Smith and associates (1953).

Tenderness and Rigidity.

Probably the most reliable of all signs distinguishing strangulating obstructions from simple occlusions is the presence of abdominal tenderness and muscular guarding or rigidity. Rebound tenderness is a commonly associated sign. However, even these signs are by no means infallible or invariable. The abdominal wall in a case of intussusception may be found to be relaxed and not tender, because the infarcted segment lies within a normal ensheathing cylinder. Hence the bloody exudate does not escape into the peritoneal cavity to produce the signs of irritability of the parietal peritoneum.

In general, the patient with a simple block exhibits no tenderness or rigidity of the abdominal wall unless the gut is so distended that its wall "weeps". In cases of colonic obstruction, when the ileo-caecal valve is competent, the colon becomes a closed loop. In such cases, there is marked tenderness over the caecum, and this is of serious significance. Tenderness may also occur in simple obstructions in which an adhesive band is attached to the anterior abdominal wall. If tenderness supervenes in a case thought to be a simple occlusion, intramural gangrene should be suspected, and early operation considered.

Mass.

The presence of a mass in a case of intestinal obstruction is suggestive of strangulation, provided a carcinoma or a primary inflammatory lesion causing an obstruction can be ruled out.

Distension.

Distension is usually present, but occasionally a patient with a strangulating obstruction and devitalized bowel may manifest little or no evidence of distension. In addition, there may be little or no evidence of gaseous distension on the X-ray film. This apparent paradox may be due, in some cases, to the rapid onset of gangrene before the proximal intestine has distended. However, a localized area of distension, particularly if it is increasing, may suggest strangulation.

Bowel Sounds.

Bowel sounds are frequently absent in strangulating obstructions. However, it has already been pointed out that the author does not find this sign reliable in obstructions generally. It is well known that an observer should listen for 10 to 15 minutes before deciding bowel sounds are absent.

Radiological Signs.

In about two thirds of the cases of strangulating obstruction there are radiological signs very similar to those of simple non-strangulating intestinal obstruction. However, strangulation should be suspected (*a*) if the incarcerated loops are relatively fixed, so that in the upright position and in the lateral decubitus the loops of bowel do not shift; (*b*) if there are long fluid levels present in the distended small bowel—far longer than usual; (*c*) if the distension of a short segment of bowel is markedly out of proportion to the distension of other intestinal coils; or (*d*) if the limbs of the strangulated loop, distended with gas and lying close together, resemble a "coffee bean" (Rigler, 1944). This appearance is due to the fact that the gaseous shadows are separated by the opposed œdematous intestinal walls, which cast an opaque shadow.

It must be realized that these radiological signs occur only in those cases in which the strangulation is not complete. In the remaining one third of all cases of strangulating obstruction, there are either no radiological changes or those that are present are very slight and require careful detection. These are the cases in which strangulation is complete. The tighter the strangulation, the more fluid and the less gas is seen within the closed loop. If the films in this group are closely scrutinized, the diagnosis of strangulation may be suggested by the presence of a single tiny fluid level and an absence of intestinal gas, or of a "pseudo-tumour" caused by the opacity of the fluid-filled strangulated segment. This has a rounded shape and is fairly well demarcated yet without the clear smooth peripheral contour of an ovarian cyst. The "pseudo-tumour" tends to be seen in the lower part of the abdomen and on the right side. Wangensteen (1956) has suggested that pneumoperitoneography may aid in the diagnosis of strangulation. He recommends that air be introduced into the peritoneal cavity through a small bore polythene tube. He states that small volumes of less than 1000 millilitres have been enough to demonstrate strangulating lesions in patients without causing discomfort. Strangulation obstruction of the large bowel is rare, and is almost confined to volvulus of the caecum and sigmoid colon. X-ray examination of the abdomen is often diagnostic in these cases.

We have considered in the foregoing paragraphs the distinguishing features between simple and strangulating obstructions. Diagnosis may, however, be delayed if another acute emergency is diagnosed incorrectly. Therefore, it is necessary to distinguish strangulating obstructions from the following conditions:

1. Peritonitis due to other causes, such as perforated appendix or perforated peptic ulcer. Usually these patients are more rigid, vomit less, and have reduced peristaltic sounds. In addition, they tend to lie still. Differentiation is not so necessary, as peritonitis is usually treated by early operation.

2. Acute pancreatitis. This is a most serious problem as pancreatitis is best treated conservatively, while strangulation obstruction demands immediate operation. In many cases, it will be impossible to distinguish them on clinical grounds, and recourse must be had to biochemical methods. The author sounds a warning concerning serum amylase estimations, which have recently been recommended. In his opinion, these are not as reliable as estimations of urinary diastase levels. He has seen a fatal case of strangulating obstruction which was diagnosed as pancreatitis and treated conservatively on the basis of a raised serum amylase level, and in spite of a normal urinary diastase level. It should be remembered that the serum amylase level is raised appreciably in strangulating obstructions, and also for some hours after the injection of morphine. This latter effect is caused by the contraction of the sphincter of Oddi.

3. Acute obstructive cholecystitis. The history and physical findings should serve to distinguish these conditions, but in both there may be a tender lump with overlying guarding, in addition to severe pain and vomiting. One case in this series was thought to be a case of cholecystitis when in fact it was really a strangulating obstruction. Delay in diagnosis led to a fatal ending.

4. Hæmoperitoneum. This may be difficult to distinguish in the early post-operative period when "windy pains" are present. If there is gross bleeding the pallor of the mucosæ may give the clue. Differentiation is not very important as both conditions require operation.

5. Hysteria. This has been mentioned earlier. Some patients with a psychopathic personality may put on such a realistic act that it is difficult to distinguish a strangulating obstruction. In doubtful cases, they should be given the benefit of the doubt as psychopaths are just as liable to organic obstruction as other people. Some patients, particularly those with drug addiction, will go to any lengths, even operation, to obtain their particular purpose, whether it is the sympathy of their friends or the injection of morphine or pethidine.

Management.

In the preceding section, the author has endeavoured to point out that (*a*) the typical clinical features of strangulation may not be present; (*b*) there is no absolutely pathognomonic radiological picture of strangulation; (*c*) the signs of strangulation may be masked by the institution of intravenous therapy and suction. (This parallels the masking by the administration of morphine of acute abdominal symptoms in general.) In some cases, the pain may disappear, the aspirations become less and the patient more comfortable. However, tachycardia persists and the aspirations, although reduced, are often fæculent. Therefore, if there is the slightest doubt in the clinician's mind that strangulation is present, operation should always be performed. In any case, if there is no improvement in twelve hours, in a patient suspected of simple occlusive obstruction, operation is indicated.

Once the decision has been taken to operate, only one or two hours at most may be allowed for purposes of resuscitation. Even if the general condition fails to improve, operation is the only hope and should be performed without delay.

In addition to the fluid and electrolyte replacement discussed earlier under "Intravenous Therapy", blood transfusion is indicated. Considerable blood may be lost into the gut, the wall of which is the seat of hæmorrhagic infection. This blood loss must be replaced, preferably by blood, but, if none is readily available, plasma, albumin, plasmosan or dextran may be used. No matter how urgent the case, a tube must be passed into the stomach or intestine and suction commenced prior to operation.

Operation.

The operation proceeds in much the same way as outlined in the section on simple occlusions. When once the strangulating mechanism has been released, a decision must be taken as to the viability of the affected bowel and the necessity for resection. The bowel is viable if

(*a*) it regains its pink or reddish colour quickly or evenly; (*b*) the arteries in the mesentery are felt to be pulsating; (*c*) its surface is smooth, glistening and elastic; (*d*) it retains its power of peristalsis and responds to gentle stimuli by contracting. The bowel is non-viable if (*a*) the colour remains dark grey, green or chocolate colour and its odour is foul (black bowel is not necessarily gangrenous); (*b*) the arteries have ceased to pulsate and the veins contain thrombi; (*c*) the peritoneal surface has lost its sheen and the bowel wall is sodden and œdematous like wet blotting paper; (*d*) it is incapable of peristalsis; (*e*) it is frankly necrotic.

These two extremes of viability and gangrene are readily recognized. However, in border-line cases, the decision may be difficult, as the risk of resection is considerably greater than that of simple release of obstruction. In doubtful cases one should apply a warm, moist pack to the bowel, and wait a few minutes. Patches of anæmia and necrosis should be carefully looked for, particularly at the sites of constriction. The bowel may subsequently perforate or form a stricture at these sites. If an experienced surgeon is in doubt as to the viability of the gut, he should resect it. If the surgeon is inexperienced and he is in doubt, he should return the doubtful gut to the abdomen.

The extent of the resection must be sufficiently wide so that the parts engaged in the anastomosis are healthy and have a good blood supply. It is usually no more difficult to include a further six to 12 inches in the resection. In practice, it is common to resect the bowel at least six inches distal and one foot proximal to the gangrenous loop. If possible, primary anastomosis should follow the resection, but in desperate cases, exteriorization may be necessary. The latter course is indicated in gangrene of the large bowel.

Most British surgeons employ the technique of open anastomosis, so that the choice of primary anastomosis lies between end-to-end and side-to-side. Each method has its protagonists. The author believes that if the ends are approximately equal in size or can be made so by oblique resection, then end-to-end suture is indicated. If not, side-to-side anastomosis, avoiding long blind loops, should be performed. In either case, the opening in the mesentery must be firmly closed.

Technical points of importance in resecting bowel include the making of an oblique anastomosis, and the detachment of mesentery to a point half a centimetre beyond the site of section of the bowel. This permits placement of every suture accurately in the bowel wall, but does not interfere with the vascularity of the bowel. Leakage is less likely to occur if this technique is followed.

Associated Medical Conditions.

As in all other surgical conditions, the presence of associated medical disease adversely affects the prognosis of acute intestinal obstruction. However, conservative measures involving suction decompression and intravenous therapy over a number of days may constitute as great a risk to such patients as a skilfully performed operation, and if urgent operation is imperative as a life-saving measure the additional hazards from associated medical diseases may have to be accepted.

Age.

The very young and the very old tolerate intestinal obstruction badly. In Grafton Smith's (1955) series of 1184 cases, 74% of the total deaths occurred in patients aged less than one year or more than 60 years. In the author's series of 154 cases, 80% of the total number of deaths occurred in patients over 60 years of age. Even so, Wangensteen (1955) reports remarkably good figures for mortality in the above 60 years age group—namely 30% mortality for patients with gangrene and 10% for patients without gangrene. Perhaps it is as Sir James Paget once said: "Years, indeed, taken alone are a very fallacious mode of reckoning age; it is not the time but the quality of a man's past we have to reckon."

Obesity.

An obese abdomen greatly increases the technical difficulty of the operation. Exposure is difficult, the tissues tear and bleed more readily, it may be impossible to perform colostomy because of a short fat mesocolon, and resection with anastomosis is more hazardous. It is of interest to recall the effect of overweight on the general expectation of life (Dublin and Lotka, 1936). For patients aged between 45 and 50 years who are 30 pounds overweight, there is about 30% increase in the death rate over the average.

There are two points of technique the author has found useful when fashioning a colostomy in obese patients: (*a*) instead of a loop colostomy, divide the colon and its mesocolon down to its root at the time of operation; (*b*) excise a layer of subcutaneous fat in the region where the colostomy is to make its exit. By these means, a colostomy may be brought to the skin level of the anterior abdominal wall. If this is not possible, a caecostomy may have to be performed. It should be noted that there is a considerable risk of abdominal wall cellulitis should the colostomy retract below the skin surface.

Malnutrition.

This is commonly associated with anæmia, protein deficiency and vitamin deficiency, and is particularly likely to occur in patients with obstruction caused by advanced malignant disease. There is an increased risk of pulmonary œdema, œdema at the anastomotic stoma and liver damage. For this reason, the hæmoglobin value should be raised to at least 80% by slow blood transfusion prior to operation. Proteins and vitamins should be given parenterally if oral intake is contraindicated. In these patients, there is also an increased tendency to burst abdomen. For this reason, particular attention should be taken in closing the abdomen. Interrupted, non-absorbable sutures are the best and, in the author's opinion, are superior to any continuous suture, including wire. As an added precaution, skin sutures should be left in place much longer than usual.

Heart Disease.

The surgical cardiac patient calls for the closest cooperation between physician, surgeon and anæsthetist. The physician should always see these patients in consultation. If congestive heart failure or auricular fibrillation is present, he will usually order digitalis. Intravenous infusion should be given slowly with the patients propped up. Packed red cells are preferable to whole blood, and the sodium intake may need careful regulation. The anæsthetist should be a senior and experienced person and take great pains to avoid anoxia, particularly in cases in which the blood supply to the heart is diminished. It should be realized that the damaged heart withstands poorly any sudden drop in blood pressure, and may be more sensitive to the toxic effects of anæsthetics. If operation is necessary, local anæsthesia may have to be used, but adrenaline is best avoided. If possible, operation should be avoided in patients with severe congestive failure, with the history of a recent myocardial infarction, with severe heart block or angina of increasing severity. However, Friedberg (1950) states that the surgical mortality is not substantially raised when operation is performed on patients with well compensated heart disease.

Respiratory Diseases.

Patients with pre-existing respiratory disease are liable to chest complications whether the obstruction is treated by operation or by conservative means. The older patient with chronic bronchitis, particularly if he is a heavy smoker, has a worse prognosis than a patient without these symptoms. The risk of complications, especially postoperative, may be reduced by gentle operative technique, by breathing exercises and postural coughing, by inhalations and by the administration of oxygen and antibiotics. The assistance of a trained physiotherapist is highly desirable. Dry lung lesions, such as non-cavitating pulmonary tuberculosis, do not increase the incidence of complications.

Urological Diseases.

Elderly patients often have associated arteriosclerotic renal disease. This may produce little evidence of renal dysfunction under normal circumstances. In conditions of stress, however, the reduced functional reserve may manifest itself by poor adaptation to disturbances of body equilibrium such as occur in dehydration, electrolyte imbalance and hypotension. Geriatric patients being treated for obstruction often succumb to uræmia. An accurate fluid chart must be kept to detect the onset of oliguria, and intravenous therapy prescribed to maintain an adequate urinary output. A common difficulty is that the uræmic patient tends not to cooperate well—the intravenous infusion and the gastro-intestinal tube may be disturbed by him. Elderly male patients must be examined to exclude a retention of urine with overflow as a cause of impending uræmia. This may be due to an enlarged prostate and require an indwelling catheter or a suprapubic cystostomy. It should be realized that a raised blood urea level in intestinal obstruction may be caused by the associated dehydration and electrolyte imbalance and not by organic renal disease. However, if the blood urea level remains high, while the obstruction is relenting, associated renal disease is likely.

Pregnancy.

If acute intestinal obstruction occurs during pregnancy, or in the post-partum period, it should be managed as if the pregnancy did not exist. By that is meant that the obstruction is at all times the most important factor to be considered, as, if it is neglected or disregarded, the patient will lose her child and perhaps her life. When colicky pain develops during pregnancy, it is only natural to think first of uterine colic. It should be remembered, however, that biliary colic and intestinal colic may occur, and these causes should be excluded.

Mayes (1950) says that, if the fœtus is viable, Cæsarean section should be the first step in the operation. This permits better exposure of the cause of the obstruction and reduces the risk of infecting the uterus from the bowel operation. Labour commencing after an intestinal operation can cause a very troublesome convalescence. If the fœtus is not viable, there is a considerable risk of miscarriage after operation for advanced obstruction.

MORTALITY FROM LEUKÆMIA IN VICTORIA, 1946 TO 1955: A REPORT FROM THE CENTRAL CANCER REGISTRY, MELBOURNE.

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THIS survey of leukæmia in Melbourne was initiated by Dr. Robert Fowler, founder and first honorary registrar of the Central Cancer Registry of the Anti-Cancer Council of Victoria. To assist in the investigation, Dr. Fowler enlisted the aid of physicians and hæmatologists from several participating hospitals. Members of this panel included Dr. G. C. de Gruchy (St. Vincent's Hospital), Dr. R. Hayes (Alfred Hospital), Dr. D. Metcalf (Royal Melbourne Hospital), Dr. R. Motteram (Cancer Institute Board), Dr. D. Forster (Prince Henry's Hospital) and Dr. R. McCulloch (Royal Children's Hospital). The Royal Women's Hospital, the Queen Victoria Hospital and the Austin Hospital also participated in the survey.

Meetings of the consultant panel were held at intervals during the inquiry to discuss the accumulating data. We are greatly indebted to members of the panel for advice and practical help in the preparation of this report. Much information on numerous features of leukæmia has been collected. This paper, however, is concerned solely with the mortality of leukæmia and its varieties during the decade of the survey.

Collection of Material.

The Central Cancer Registry, Melbourne, maintains a record of every person admitted to a participating hospital, diagnosed as suffering from malignant neoplasia. The case abstracts of leukæmic patients, held at the Registry, were the basis of the survey. A careful search was made in the records of all participating hospitals to ensure that no diagnosed case of leukæmia had been omitted solely through a failure in registration. This search covered the records of pathology departments, including autopsy reports, and files of medical histories. Few, if any, cases diagnosed as leukæmic in participating hospitals can have been omitted from the sample. The names of all persons notified to the Registrar of Deaths as dying of leukæmia in Melbourne in the period 1946 to 1955 were checked against the lists of leukæmic cases held in the Cancer Registry. The Cancer Registry conducts a continuous follow-up survey on all registered persons until they die. The medical history of every patient registered at the Central Cancer Registry was examined by one of us or by a member of the panel. The validity of the diagnosis of leukæmia and the type was scrutinized. In dubious cases, the original biopsy and autopsy specimens were reviewed, if available. When doubt still remained, the type was designated "unspecified". Patients obviously suffering from leukæmia sometimes die before hæmatological investigations can be completed, and permission for an autopsy may be withheld. In the Registry sample of 634 leukæmias, the type remained unspecified in 36 cases (6%).

TABLE I.

Mortality from Leukæmia, Victoria, 1946 to 1955 (Including a Comparison of Deaths Observed with the Numbers Estimated Each Year, Assuming no Variation in Mortality).

Year.	Estimated Population. (Millions.)	Mortality per 100,000.	Deaths.	
			Observed.	Estimated.
1946	2·00	3·0	60	98
1947	2·06[1]	4·8	99	100
1948	2·11	4·8	102	103
1949	2·16	4·9	105	106
1950	2·22	6·0	132	108
1946 to 1950	—	4·7	498	515
1951	2·27	4·8	109	111
1952	2·33	5·2	120	114
1953	2·39	5·4	130	117
1954	2·45[1]	4·7	116	120
1955	2·52	5·1	127	123
1951 to 1955	—	5·0	602	585
1946 to 1955	—	—	1100	—

[1] Census years.

The Central Cancer Registry Sample.

The large teaching hospitals associated with the Central Cancer Registry supply diagnostic and therapeutic services for the Melbourne metropolitan area, of which the population at the 1954 census was 1,544,500. They also serve, although to a less extent, the extra-metropolitan areas of the State (population 907,800), particularly for such diseases as leukæmia, in which specialized investigations are sought. The relative cover for the metropolitan and extra-metropolitan areas is indicated by the following data. Of notified deaths in the metropolitan area, a registration at the Central Cancer Registry had been made in 55% (356 of 647 deaths), while in the extra-metropolitan area the cover was reduced to 38% (157 of 418 deaths).

Mortality from Leukæmia.

During the decade 1946 to 1955, 1065 deaths from leukæmia were notified in Victoria. A name-by-name comparison of all deaths with all registered cases disclosed that leukæmia had not been specified as the cause of death in 35 persons who had died in the decade and who had been registered prior to death as leukæmic. Since the diagnosis in each case had been well established, these 35

TABLE II.

Leukæmia and Its Types, Victoria, 1946 to 1955; Estimated Age-Specific Mortality Rates (per 100,000).

Type.	All Ages.	Age Groups.							
		0 to 9.	10 to 19.	20 to 29.	30 to 39.	40 to 49.	50 to 59.	60 to 69.	70 to 79.	80 to 89.
Myeloid, acute	1·4	0·6	0·9	0·9	1·0	1·4	2·3	1·3	5·2	3·2
Myeloid, chronic	0·9	0·0	0·1	0·3	0·7	1·0	2·0	2·6	4·1	1·1
Lymphatic, acute	1·7	4·0	1·4	0·5	0·4	0·7	1·0	1·4	0·3	0·0
Lymphatic, chronic	0·8	0·0	0·0	0·0	0·1	0·5	0·8	3·8	6·6	9·5
Monocytic	0·3	0·2	0·3	0·2	0·2	0·3	0·4	0·3	0·0	0·0
All types	4·9	4·8	2·6	1·9	2·3	3·8	6·4	11·9	16·1	13·8

deaths have been added to the notified number, 1065, giving a total of 1100 deaths. In these 35 deaths, the cause of death, as stated on the death certificate, was consistent with leukæmia.

The mortality per 100,000 of population for each year from 1946 to 1955 is shown in Table I, which is based on notified deaths, *plus* registered cases of patients known to have died from leukæmia, but not so certified. The population of Victoria increased by 25% from two to two and a half millions in the decade, due to a rising birth rate and to immigration. Account must be taken of this trend in estimating whether the incidence of leukæmia varied during the period. Inspection of Table I is sufficient to indicate that leukæmia has not varied noticeably in incidence, except for a significantly low number of deaths recorded in the first year of the survey, 1946. The deficiency in this year may be due to the partial dislocation of civilian medical services associated with World War II. For the remaining nine years, 1947 to 1955, the mean annual mortality is 5·1 per 100,000, and there is no significant departure from that rate sufficient to be detected in a sample of this size.

Incidence of Types of Leukæmia.

Records at the Central Cancer Registry provide a type diagnosis for 55% of metropolitan and 38% of rural deaths attributed to leukæmia. Type distribution in the remainder may be assumed to be the same as in those deaths for which a type diagnosis is available, provided the latter deaths are a fair sample of the total. Examination of the age distributions of certified deaths, and of the sample of these deaths recorded at the Cancer Registry, indicates that the Cancer Registry sample is relatively deficient in middle-age and elderly subjects. The proportion of certified deaths of persons previously registered at the Cancer Registry as leukæmic diminishes progressively with advancing age, from 61% in those up to 19 years of age to 37% in those aged 80 or more years at death. The reason for this trend is that several large institutions caring for the aged were not participants in the survey.

A separate estimation of type distribution was made, therefore, for each decennial age group. For example, in the decade, 157 persons aged 50 to 59 years died of leukæmia. A diagnosis of type was available for 73. The total mortality for the age group, 6·4 per 100,000, has been divided among the types of leukæmia in the same proportions in which each type was diagnosed in the 73 cases recorded at the Cancer Registry.

Estimations of age-specific mortalities for the main varieties of leukæmia are presented in Table II.

Discussion.

Two trends discernible in the present survey are relevant to the general problem of whether or not the incidence of leukæmia is increasing. Mortality from leukæmia in Victoria was 4·7 per 100,000 in 1946 to 1950 and 5·0 per 100,000 in 1951 to 1955. The slight over-all increase, which is not statistically significant, was confined to the older age groups. In persons aged 70 or more, the number of deaths from leukæmia increased from 62 in the first quinquennium to 105 in the second, a rise in the mortality rate from 5·5 to 8·4 per 100,000. It seems highly improbable that the true incidence of leukæmia has increased by 50% in this age group, while remaining stationary in the remainder of the population. The alternative and more reasonable explanation is that the increase reflects an increasing awareness of the occurrence of leukæmia, especially acute leukæmia, in the aged.

The second noteworthy feature of the Victorian experience is the increasing tendency to diagnose acute leukæmias in adults as myeloid, rather than as lymphatic or monocytic. As shown in Table III, the percentage of

TABLE III.

Leukæmia: Type Distribution at Death, 1946 to 1950 and 1951 to 1955, Melbourne.

Type of Leukæmia.	Relative Frequency of Each Type	
	1946 to 1950.	1951 to 1955.
Myeloid, acute	0·20	0·38
Myeloid, chronic	0·16	0·16
Lymphatic, acute	0·39	0·30
Lymphatic, chronic	0·14	0·14
Monocytic	0·11	0·02
All types	1·00	1·00

all leukæmias diagnosed as acute myeloid increased from 20% in 1946 to 1950 to 38% in 1951 to 1955. This rise is offset by a corresponding decrease in the percentages attributed to acute lymphatic and monocytic types, which fell from 50% of all leukæmias in 1946 to 1950 to 32% in 1951 to 1955. As the total mortality from leukæmia did not rise significantly in the interval, the apparent increase in incidence of acute myeloid leukæmia must reflect changes in diagnostic opinion. A similar trend is noted in recent reports from several centres. Whereas in earlier reports chronic leukæmias were found to predominate over acute, usually in the ratio of about 6:4 (Gauld, Innes and Robson, 1953), in more recent reports an increasing proportion of acute cases is noted. The ratio of acute leukæmias to chronic in New Zealand for the period 1950 to 1954 was 66:34 (Gunz and Hough, 1956), and in Melbourne for the period 1951 to 1955 it was 67:33 (present series). McMahon and Clark (1956), reporting 1709 cases of leukæmia in Brooklyn, New York, from 1943 to 1952, classed 44·6% as acute, 44·8% as chronic, 3·1% as subacute, and 7·8% as unknown. Irrespective of how the subacute cases are allotted, these findings are in conformity with the suggestion that the more recent the survey, the higher the proportion of cases classified acute.

A more detailed comparison of the experience in Melbourne in 1951 to 1955 with that of New Zealand in 1950 to 1954 is presented in Table IV. In their table of age-incidence, the New Zealand workers treat all acute

TABLE IV.

Comparison of Estimated Age-Specific Mortality Rates per 100,000, in New Zealand, 1950 to 1954, and Melbourne, 1951 to 1955.

Age Group.	Acute Myeloid.		Acute Lymphatic.		Chronic Myeloid.		Chronic Lymphatic.		Total.	
	New Zealand.	Melbourne.	New Zealand.	Melbourne.	New Zealand.	Melbourne.	New Zealand.	Melbourne.	New Zealand.	Melbourne.
0 to 4 ..	1·1	0·7	3·9	5·1	0·1	0·0	0·0	0·0	5·1	5·8
5 to 14 ..	0·9	1·2	2·0	1·8	0·0	0·0	0·0	0·0	2·9	3·0
15 to 24 ..	1·0	1·0	0·2	0·8	1·4	0·1	<0·1	0·0	1·6	1·9
25 to 34 ..	0·7	1·0	0·4	0·2	0·5	0·4	0·0	0·0	1·6	1·6
35 to 44 ..	1·1	1·5	0·5	0·2	0·8	0·9	0·1	0·3	2·5	2·9
45 to 54 ..	1·8	2·1	0·8	1·0	1·3	1·4	0·3	0·1	4·2	4·6
55 to 64 ..	3·8	3·8	3·3	1·5	2·5	1·1	2·3	2·7	11·9	9·1
65 to 74 ..	4·9	4·8	4·2	1·0	3·5	4·3	5·1	4·3	17·7	13·4
75 and over ..	4·8	9·2	4·2	0·0	3·6	3·7	8·9	11·2	21·5	24·1

leukæmias as a single group, considering separation into types unprofitable in the present state of knowledge (Gunz and Hough, 1956). However, approximate estimates of age-specific mortalities for acute myeloid and lymphatic leukæmia, as shown in Table IV, can be made, using their data. The notable feature of the comparison is the close agreement of the findings for New Zealand and Melbourne. Discrepancies are confined to the relative frequencies of acute myeloid and lymphatic leukæmia in persons over 50 years of age. In Melbourne, acute lymphatic leukæmia is diagnosed in adults less frequently than in New Zealand. Similar disagreements were formerly noted in the differential diagnosis of the acute leukæmias in childhood, now generally regarded as predominantly lymphatic. To quote Gunz and Hough (1956): " . . . the total incidence of leukæmia shows a noteworthy uniformity over a large segment of the world. It seems unlikely that where this is the case, there can really be extreme variations in the type distribution, particularly when it is remembered that the most pronounced divergencies are recorded in reports from neighbouring parts of the United States."

The discrepancies must be attributed to differences in diagnostic standards between individual observers. The substantial agreement between the recent findings in Melbourne and New Zealand gives reason to hope that such differences of opinion are gradually being resolved.

Conclusion.

The present situation in Melbourne, as shown in Table IV, may be summarized as follows. Leukæmia in early childhood is invariably regarded as acute, and nine-tenths of all acute leukæmias in children are diagnosed as lymphatic. In persons after 20 years of age, nearly all acute leukæmias are considered to be myeloid. Chronic myeloid and lymphatic leukæmias are about equally frequent. A diagnosis of chronic lymphatic leukæmia is rarely made in a person under 50 years of age. A diagnosis of monocytic leukæmia is now uncommon.

The stimulus to studies in this field is the hope that elucidation of the characteristic age distributions of the varieties of leukæmia may provide clues as to ætiology, and for this reason continuance of such investigations is desirable.

Summary.

1. The results are presented of a survey of leukæmia in the State of Victoria, Australia, from 1946 to 1955.

2. No significant increase in mortality from leukæmia was apparent during the decade.

3. Relatively more older people were certified as dying of leukæmia in the later years of the survey. This trend is attributed to improved diagnosis.

4. Tables of age specific mortality rates are given for leukæmia and its chief varieties.

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References.

GAULD, W. R., INNES, J., and ROBSON, H. N. (1953), "A Survey of 647 Cases of Leukæmia, 1938-51", *Brit. M. J.*, 1: 585.

GUNZ, F. W., and HOUGH, R. F. (1956), "Acute Leukæmia over the Age of Fifty: A Study of its Incidence and Natural History", *Blood*, 11: 882.

MACMAHON, B., and CLARK, D. (1956), "Incidence of the Common Forms of Human Leukæmia", *Blood*, 11: 871.

EXTRACRANIAL CAUSES OF HEADACHE.[1]

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MY TASK tonight is to deal with extracranial sources of headache, and although migraine is probably extracranial in many aspects I shall not deal with it further. Headache is basically due to two main causes: (i) stimulation of pain-sensitive intracranial structures, with the source of stimulation either outside the skull, as in fever, etc., or inside, as in tumour, etc.; (ii) extracranial sources of pain with the pain component referred to the head, and it is rarely indeed that the source lies below the clavicle.

I shall briefly summarize the pain-sensitive structures inside the skull: (i) the great venous sinuses and their tributaries; (ii) the dura mater lining the floor of the anterior and posterior cranial fossæ; (iii) the meningeal arteries; (iv) the fifth, ninth and tenth cranial nerves and the upper three cervical nerves. Stimulation of any of these structures above the tentorium produces pain referred to the trigeminal area as far back as a line drawn over the skull from ear to ear. Stimulation of a pain-sensitive structure below the tentorium produces the pain referred behind this line in the occipital nuchal and post-auricular areas.

Next I shall remind you that, outside the skull, all the tissues are more or less sensitive and can cause pain, but the most important structures in this regard are the extracranial arteries.

The mechanisms for the production of headache are: (i) dilatation of sensitive cranial arteries, whether intracranial or, as in migraine, extracranial; (ii) traction, displacement or inflammation of the above-mentioned structures inside the skull; (iii) prolonged contraction of the muscles about the head and neck from reflex causes; (iv) referred pain from sources usually above the clavicle, e.g. headache from ocular disorders. Of all these, the commonest cause of headaches is either vascular dilatation or sustained pericranial muscular spasm.

I shall therefore concentrate on those conditions which impinge on these two final common pathways, dealing first with vascular dilatation. I will briefly mention the paradox of migraine, which has an intracranial phase of

[1] Read at the combined meeting of the Sections of Medicine and Neurology, New South Wales Branch, British Medical Association, on April 24, 1958.

vaso-constriction and a mainly extracranial phase of vaso-dilatation. I have seen a patient who had such severe distension of vessels in this phase that petechiæ appeared in the skin around the eyes. The next common cause of vaso-dilatation is fever, and although this sounds an obvious cause for headache I suggest a thermometer as the first tool in the examination of a patient with headache. You will get surprises; some fevers, especially those of viral origin, appear well tolerated by the patient, who may not look ill and in whom headache may be the only complaint. Typhoid, brucellosis, pyrexia of unknown origin and influenza may present in this manner. Although dilatation itself is a painful state, some workers have stressed that a wide amplitude of pulsation is the more usual cause of pain.

Hypertension classically causes a morning occipital headache. Most textbooks allege that it is unrelated to the height of the blood pressure, and some writers even state that it is iatrogenic. I disagree with both these statements, and a return of headaches in a hypertensive patient under treatment often indicates poor control of the blood pressure. With good pressure control, headaches of this type often go away. This is not due to a specific effect by ganglion-blocking agents on vaso-dilatation, because similar effects can be obtained with other types of antihypertensive agents. As headaches may be the presenting symptom of severe hypertension, I think the iatrogenic origin can be ruled out, if we limit the hypertensive headache to this particular type. A morning headache is not, however, diagnostic of hypertension, and one must think of: (i) the post-epileptic headache, when the fits are occurring unnoticed at night; (ii) alcohol; (iii) sinus infection; and (iv) brain tumour.

Two other more or less obvious causes of headache are hypoglycæmia and the opposite, namely, ketotic hyperglycæmia. The latter type is slow to respond, but as the ketones are eliminated the headache settles down. Alcoholic drinks may cause headache, especially the sparkling wines containing carbon dioxide. Some people need to have the relationship pointed out to them, and the headaches may be associated with night sweats also from the alcohol. Methyl alcohol causes rapidly developing visual disturbances as well as headaches. Another common cause of headache is nicotinism from excessive smoking. Less common is lead, mercurial and arsenical poisoning. The gastro-intestinal toxins, so beloved by patent medicine manufacturers, are a myth, but rectal distension can cause headache; more often the cause of the constipation and headache are one, such as a low-grade fever with influenza. Severe anæmia may cause headache. I find this type of headache a great rarity, and the mechanism may be anoxia; it may resemble the headache of those suddenly exposed to a low atmospheric pressure, e.g. above 14,000 feet. Polycythæmia may cause headache, and not always is the clinical picture self-evident. Hunger is a common cause of headache, and I would not be surprised if the factory girls who take a "Bex" powder with their morning tea are not in this class, owing to their scanty, figure-preserving breakfast. I have been impressed by the frequency with which methæmoglobinæmia and sulphæmoglobinæmia are found if looked for, and this may lead to further headaches, because the methæmoglobinæmia causes anoxia, and hence the taking of more A.P.C. mixtures. The phenacetin component can even lead to a superimposed hæmolytic anæmia. A negative result to a spectroscopic examination of the blood does not exclude this condition, as symptoms can be produced at levels below that which produce a positive result. Endocrinal causes of headache are not spectacular. Hypothyroidism may be an offender, and the menopause, by virtue of its vasomotor upsets, is frequently blamed, but psychological disturbances may be more important than endocrine factors. Allergy is regarded by some as a genuine cause of headache. I have never been able to satisfy myself about this, as one would expect a certain time-relationship to foods and inhalants. Ogden (1957) in America said that "the importance of allergy as a cause of headache is obvious to most of us", but he was addressing the local brotherhood of allergists and so his words have a bias. His colleague Unger (1952) states that "migraine is an allergic disease", but this is myopia at its worst, because students of migraine list a host of exciting agents which trigger off the final mechanism of migraine, and allergy is just one on the list.

Most of the distant causes of headache are fairly obvious, and a goodly proportion are trivial. A more serious and certainly a more difficult problem is the headache associated with a disturbance of the psyche, because headache, like all pain, has two components: (i) the sensation of discomfort; (ii) the emotional reaction engendered by the pain. The latter is conditioned by the personality, and past pain experience of the individual, and anyone who has had frequent painful dressings of a wound knows what the latter means.

In private practice, no doubt the commonest headaches are functional. I suspect things are quite different in hospital, where these individuals are seen infrequently, because they are not ill enough for admission. There appear to be two main types of functional headache: (i) the common tension headache, the cause of which becomes obvious after a short interrogation of the patient's way of life. Often the patient is attempting to do too much. (ii) The "trap" headache, wherein a person is chronically unhappy because of an insurmountable life situation, e.g. the girl who wants to marry but feels she cannot leave aging parents, etc. This and similar problems are a challenge to physicians, as the psychic disturbance can be manifested not only as headache, but also as heartache, pelvic ache, etc., and their recognition often depends on the time a specialist is inclined to give to history taking. One should try to make a positive diagnosis of a functional headache, but, having done so, to proceed to put the patient "through the hoops", or else one day an organic cause may be missed. The reason for this is that on occasions an organic lesion causes a disturbance of the psyche, and I quote a case from Weiss and English's text-book:

> A twenty-two year old nurse with recent onset of headache, described as a pressure feeling all over the head; relief with aspirin, tiredness and listlessness. The patient screamed at times, became emotional and confused, but on being spoken to could be brought into contact. She was dissatisfied with her job, and had left a congenial one just before the onset of her headaches. She disliked her stepfather and her family, as they disapproved of her financé. Proven diagnosis: a medulloblastoma of the left cerebellar hemisphere.

The moral is that bizarre description of head pains is not a cachet for the diagnosis of functional headaches.

The personal idiosyncrasy to headaches varies from those who are martyrs to them to those who have never had one in their lives. I suspect that this is not a matter of temperament so much as it is related to the pitch of vasomotor control in the intracranial and extracranial arteries. Functional headaches brought on by unrelieved nervous tension are often constant, although in the first year or so holidays may relieve the headaches; after a while they appear to become fixed in their neuronal pathways, and do not abate while on vacation. This mechanism of facilitation is a real one and, like the pathway for nervous tics, has, I think, the same tendency to become engrooved and are then very difficult to cure, and one may say with Alvarez that the headache is "habitual". The moral here, I think, is that mental hygiene should be taught to warn people that an over-intent, headache-producing life is likely to lead to trouble later on.

The trap headache is much more difficult to deal with, and mental catharsis, sympathy and explanation of cause and effect may be all that one can do.

I shall say a word or two about the therapy of functional headaches. Medication means different things to different patients. To one patient (and they are common enough) the symbolism of medication is that of a sign of weakness, or punishment for aggression, and they may not take the drugs ordered. To others it may represent a symbol of love and affection, a representation of mystical

power, a true projection of the prescriber's personality. Any ill-advised remark by a dispensing pharmacist may undo a great deal of good in the field of psychotherapy. One final remark on this subject: always accept the patient's complaint of headache as genuine. It is wrong to regard any headache as imaginary, and relief from a placebo, if it proves anything, proves only the efficacy of suggestion. Unfortunately, the success of this type of therapy is short-lived.

I shall now deal with headaches arising in structures closer to the head. Temporal or occipital arteritis occurs in the elderly. Pain begins in the region of the affected vessel, and as it becomes more severe spreads widely over the side of the head, interfering with sleep and lasting for weeks or months. It is diagnosed by palpating a tender cord, often of a thrombosed artery, and finding, sometimes, loss of vision from a central retinal artery obstruction. Fever, malaise and sweats occur. One can readily miss the diagnosis in cases of occipital arteritis because of its deeper course, unless the possibility is kept in mind. The nasal accessory sinuses, when acutely infected, can cause headaches, often temporal or retro-orbital when the upper group is affected. I like to see clear-cut evidence of radiological clouding and purulent nasal discharge. Some mucosal thickening in a sinus X-ray picture is not, I think, enough to incriminate sinus infection as a cause of headache. Eye strain is often self-evident, and most patients with headache have visited their ophthalmologists before they report to the physician. Wolff has shown, by using a three-diopter prism over one eye, that sustained contractions occur in the extraocular muscles of the orbit and in the frontal, temporal and even occipital muscles, which produce pain. Glaucoma probably sets up a similar mechanism. If the pain in the frontal area is severe, flashing and momentary, trigeminal neuralgia has to be considered, but tic douloureux is not a cause of prolonged headache.

I now turn to a very large and important group of headaches arising from muscles, ligaments and joints about the skull. Wolff has shown that any prolonged muscular contraction can be painful. Some other workers attribute this to secondary muscle ischæmia. The muscular spasm may be voluntary or reflex. The voluntary type is typified by a man aged 44 years, a bustling, overanxious, second-hand car salesman with severe hypertension. He was getting the usual morning headaches, which went away when the blood pressure was controlled. More difficult to eliminate are the frontal headaches which come on with worry or glare and vanish at the week-end. This man is heavy-lidded and has a continually wrinkled brow when not in repose, and as he himself has said, the frontal headache goes away if he can relax. The reflex type of muscular spasm is commoner, and the primary site may be in the neck joints; nuchal causes should always be sought for headache over the back half of the head. Any fibrositic, arthritic or inflammatory lesion in the area of the neck represented by the upper three cervical nerves can cause pain in the head in the distribution of the greater occipital nerve. The following case is an example.

A male diabetic patient, aged 68 years, kept the patients in the ward awake with complaints of pain in the posterior half of his head. Clinical and radiological examination failed to elucidate the cause, and diabetic neuritis was considered; that magical therapeutic corollary, "Vibex", was given, with quite unmagical results, however. In an attempt to block the greater auricular nerve, a procain injection was commenced over the site of exit of the second cervical nerve. Pus was aspirated before the injection was commenced, and it transpired that the needle had entered a small osteomyelitic abscess in the body of the second cervical vertebra. Reexamination of the X-ray plates showed a tiny lesion. The headache was cured by immobilization and appropriate therapy.

Rheumatoid arthritis affecting the upper apophyseal joints can similarly produce pain in the head.

Headache from reflex sites below the brow is uncommon, and I have mentioned the eyes and the nasal sinuses. One other site is the temporo-mandibular joint, and this type of headache may last for years until correction of the bite is undertaken. Berlin *et alii* (1957) studied 105 patients with this Costen's syndrome, and concluded that tension in the pterygoid and other muscles of mastication led to headache.

Coming closer to the skull, I remind you of the wisdom of palpating and auscultating the skull; a local patch of tenderness may indicate an expanding secondary carcinoma, or a lump may suggest a rare gumma. Change in size may be due to Paget's disease of the bone. Permanent headache may occur in craniostenosis, which is evident either as oxycephaly or scaphocephaly.

A rarer type of headache, often with facial rather than cranial pain, is Horton's autonomic facio-cephalgia. It comprises attacks of severe pain lasting some hours, and is accompanied by lachrymation of the eye on the affected side and by a running nose. It was once considered to be a histamine-induced condition, but it is now thought to be a neuritis of the greater superficial petrosal nerve, which carries the efferent parasympathetic vasodilator fibres to the pia mater and at the same time secretory fibres to the lachrymal gland and mucosa of the nose. In one series 75% of cases received benefit, some temporary, from section of the nerve. I have a man who has had this condition since 1942; the site of pain varies from side to side and the attacks may last up to six weeks, with paroxysms coming on once or twice a day. The cycle may recur once a year or less often, and despite intensive investigation no cause has been found.

Referred pain from below the clavicle occurs in angina pectoris or myocardial infarction, but its uppermost limit is usually the jaw. Russell Brain's description of spread of this pain to the temple is outside my experience. I have seen myocardial infarction cause pain reference to the occipital protuberance in a patient, but this man had underlying cervical disk degeneration, and facilitation might have occurred.

It is said that the surface representation of thoracic and abdominal pain mediated by the vagus lies in the trigeminal area. I cannot recall such a picture, but the central pathways are certainly there.

How should one investigate a patient with a headache problem? First, accept the symptom as real, and work on the history for clues, organic and functional. Also, assess the patient's ability to stand pain, and perform a full clinical examination. The tests which may prove helpful are: (i) examination of the urine; (ii) X-ray examination of the skull; (iii) ophthalmic examination, including fields; (iv) electroencephalogram; (v) Wassermann reaction; (vi) blood chemistry; (vii) lumbar puncture; (viii) arteriogram; (ix) air encephalogram or ventriculogram; (x) ear, nose and throat consultation and allergy testing.

In conclusion I shall give a word or two on the therapy of headache. Friedman and Merritt (1957), of the headache unit of the Montefiore Hospital in New York, after analysing 5000 cases, state that they aim to relieve symptoms by: (i) raising the threshold of pain; (ii) interrupting the mechanism producing pain; and (iii) reducing the emotional tension and anxiety associated with the pain. They consider that aspirin elevates the pain threshold half as much as morphine, and doses over nine grains are no more effective than this dose. Frequent administration is necessary. A.P.C. mixtures containing codeine are not synergistic, and the pain is relieved by the strongest component, so pure codein is just as effective as A.P.C. mixtures with codeine.

Central nervous system stimulants combined with an analgesic make an effective combination, e.g. dextroamphetamine and salicylate are useful for hangover headache.

Caffeine is now considered to be a cerebral vasoconstrictor as well as a powerful cerebral stimulant, and this may explain its use as an adjuvant to ergotamine in migraine. A good compound for tension headache is caffeine, aspirin, phenacetin and a quick-acting barbiturate.

References.

BERLIN *et alii* (1957), quoted in the Interim Supplement to the British Encyclopaedia of Medical Practice, No. 181, October.

FRIEDMAN, A. P., and MERRITT, H. H. (1957), "The Treatment of Headache", *J.A.M.A.*, 163: 1111.

OGDEN, H. D. (1957), "Types of Headache and Their Treatment", *South. M. J.*, 50: 441.

UNGER, A. H., and UNGER, L. (1952), "Migraine is an Allergic Disease", *J. Allergy*, 23: 429.

SOME OBSERVATIONS ON THE MANAGEMENT OF THYROID DISEASE.

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DURING the past fifteen years progress in the understanding and treatment of thyroid disease has been so rapid that medical men have found it hard to keep pace with developments. The well-known lag in the introduction of new ideas into text-books also means that little help is to be gained by consulting their chapters on goitre. To analyse current habits of treatment among doctors in New South Wales, a survey was made of the previous therapy received by 507 patients with goitre seen at a private clinic during the years 1956-1957. Patients with carcinoma of the thyroid or thryroiditis have been excluded.

Of these 507 patients, 130 were diagnosed as thyrotoxic and 377 were considered to have non-toxic goitre. Other findings were as follows:

The number of patients receiving "thyroid-affecting" medication was 129 (25%).

The number of patients receiving antithyroid drugs was 83; of these, 49 (59%) were hyperthyroid, and 34 (41%) were euthyroid.

The number of patients with non-toxic goitre was 377: of these, 34 (9%) were receiving antithyroid drugs, 33 (9%) were receiving iodine therapy, and 12 (3%) were receiving thyroid therapy.

Patients Receiving "Thyroid-Affecting" Medication.

Patients were placed in this category if they had received iodine, iodides or thyroid extract within two months prior to being seen, or if they had taken antithyroid drugs, chiefly "Neo-mercazole" or methyl thiouracil, within the three months before they attended. It has been recognized since the inception of radioiodine uptake testing that previous iodine medication will interfere with normal uptake by the gland. The time taken for this effect to wear off is variable, and depends on a number of factors including the iodine dosage, the length of time it has been administered and the degree of activity of the gland. Experience has also shown that overdosage with antithyroid drugs in normal or thyrotoxic subjects will cause a falsely high result from the iodine uptake test, and this high reading may persist for as long as three months (Werner 1955, Rundle *et alii*, 1956).

It will be seen that 25% of all patients referred for an opinion had been receiving medication which prejudiced the chances of a satisfactory result from a radioiodine uptake test. This test and the estimation of serum protein-bound iodine are the sheet-anchors of laboratory investigation of thyroid disease, and their value in diagnosis is equalled only by the more laborious and inconvenient process of long-term clinical observation. Because the estimation of serum protein-bound iodine is a difficult technical procedure, this test can be done only in certain specially equipped laboratories, and it is not as widely available as the radioiodine uptake estimation. With modern techniques of measurement of gland uptake of radioiodine (Oddie, 1957), a clear-cut separation of hyperthyroid, euthyroid and hypothyroid subjects can be obtained. It is therefore very important that all patients should be given the benefit of this investigation when the clinical diagnosis is in doubt. However, if iodine or antithyroid drugs have been given previously, a delay of one to three months must ensue before the test can give useful information.

Therefore, ideally, all patients with thyroid disease in whom the diagnosis is in doubt should be referred to an appropriate hospital or diagnostic centre for a radioiodine uptake test before any therapy is instituted. Adherence to this principle would save a great deal of time and trouble in the final analysis and would lead to more accurate diagnosis and to more efficient therapy.

Thyrotoxic Patients on Anti-Thyroid Drugs.

Of 130 patients finally diagnosed as thyrotoxic, 49 (31%) were having antithyroid drugs when first seen. In some cases this did not matter as the disease was florid and the diagnosis ovbious. However, in a number of instances it was impossible to decide whether the patient had well-controlled thyrotoxicosis or whether one was dealing with a euthyroid patient who had been given antithyroid therapy with resultant compensatory hyperplasia of the gland. In the latter case the thyroid enlarges and develops a bruit from increased vascularity, so that it indistinguishable from the goitre of Graves's disease.

The importance of this distinction is shown in the following figures. Of 83 patients receiving antithyroid therapy when first seen, 49 had thyrotoxicosis and 34 had non-toxic goitre in the final assessment. As none of the tests for thyrotoxicosis are of any value while the patient is taking antithyroid drugs, the only way of proving the diagnosis is to stop treatment and allow the disease to escape from control. One is reluctant to deliberately make a patient ill, but this is a lesser evil than employing surgery or radioactive iodine treatment in a case in which it is unnecessary. This is obviously unsatisfactory for all concerned, and such a situation could be avoided if an uptake test was done before starting therapy.

Euthyroid Patients.

If the 377 patients with non-toxic goitre, 34 (9%) were receiving antithyroid drugs. This was invariably due to the presence of a coincidental anxiety state, which produced symptoms and signs superficially resembling thyrotoxicosis. In some cases therapy had been pushed to the stage of production of hypothyroidism and a large compensatory goitre. This diagnostic error is easily made, but could be simply avoided once again by the use of uptake tests before instituting therapy. An estimation of the basal metabolic rate is of no value in these instances as it usually gives a high result in the presence of tension or anxiety states and may be responsible for perpetuating the original clinical error. Such a high incidence of mistaken diagnosis should not occur if the possibility of error is kept in mind and full use is made of modern diagnostic aids.

Iodine therapy had been given to 33 patients with non-toxic goitre. In none had any improvement been noted, although admittedly some had only had the treatment for a short time. However, five patients had been taking iodine for periods ranging from nine months to two years, and in none of these had the goitre diminished in size. In fact in one patient the goitre had appeared while she was taking five grains of potassium iodide three times daily for asthma. This phenomenon has been reported previously (Bell, 1952). Another patient had taken small doses of iodine for five months without any decrease in the size of the gland, but after six months of thyroid therapy marked diminution of the goitre was evident. Although iodine treatment is still advocated in text-books and there are theoretical reasons why it should do good, we have never observed any improvement in an established goitre after its administration. Iodine is generally accepted as the best prophylactic measure against the development of goitre, and its use is firmly established for this purpose, although it may not always be effective (Clements, 1955). The corollary that it will cure established goitre has never been proven.

In the treatment of non-toxic goitre, thyroid extract and "Thyroxine" are the quickest and most efficient drugs, and yet in this group they had been given to only 3% of patients. If care is taken to give enough to suppress iodine

uptake by the gland, we have never known it to fail to decrease the goitre within six months. Even nodular goitres will diminish in size with this therapy, although it is rare for the nodules to disappear. With such an effective form of treatment available there is no reason for persisting with iodine therapy in non-toxic goitres, and its use should be abandoned.

Summary.

Current habits in the treatment of thyroid disease are briefly reviewed. A plea is made for the use of a radio-iodine uptake test before treatment is commenced in all patients in whom the diagnosis is in doubt. To start treatment without adequate investigation may involve the patient in long delays, inconvenience and discomfort during subsequent attempts to confirm the diagnosis.

It is suggested that the use of iodine therapy in non-toxic goitre should be abandoned, and that thyroid extract be used instead.

References.

BELL, G. O. (1952), "Prolonged Administration of Iodine in the Pathogenesis of Simple Goiter and Myxedema", *Tr. Am. Goiter A.*, 28.

CLEMENTS, F. W. (1955), "A Thyroid Blocking Agent as a Cause of Endemic Goitre in Tasmania: Preliminary Communication", M. J. AUSTRALIA, 1: 369.

ODDIE, T. H. (1957), "Outline of Early Radioiodine Uptake Test for the Assay of Thyroid Function", M. J. AUSTRALIA, 2: 11.

RUNDLE, F. F., SELDON, W. A., and INDYK, J. S. (1956), "A Radioiodine Uptake Test and Its Application in Clinical Diagnosis", M. J. AUSTRALIA, 1: 732.

WERNER, S. C. (1955), "The Thyroid", Hoeber, New York: 221.

Reports of Cases.

RECOVERY FROM THE INGESTION OF SODIUM NITRITE IN ANTI-RUST POWDER.

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THE British Pharmacopœial dose of sodium nitrite, which is not legally a poison, was from half to two grains.[1] Death has been reported from a dose of 30 grains; in the present case a more or less spontaneous recovery occurred after the patient had taken approximately 60 grains. In the following report events are described in chronological sequence, but some of the information, such as the inadvertent administration of sodium nitrite, only became available subsequently.

Clinical Record.

Mrs. A., a housewife 50 years old, was admitted to hospital the day before an elective total hysterectomy for fibromyomata was performed. The operation and post-operative course were uneventful. On admission to hospital her systolic blood pressure was 160 millimetres of mercury, and immediately post-operatively it was 120 millimetres, rising to 140 millimetres when the recordings were discontinued. After the first 36 hours her temperature was not above 98·2° F., except on the evening of the fifth post-operative day when it reached 98·8° F. By the eighth day she was feeling very well and was up to toilet. At 8 p.m. she complained of "windy pains" and was given an A.P.C. mixture ("it tasted rather bitter"), to which two level teaspoonsful of sodium bicarbonate were added. Some hours later it transpired that a proprietary anti-rust powder, normally used with "Zephiran" solution, had been inadvertently administered instead of sodium bicarbonate. The powder consists of two parts commercial grade soda ash and one part of sodium nitrite; the estimated dose of the latter was about 60 grains. Within a few minutes she became distressed and was noted to be pale and shivery. She complained of tingling and numbness in her limbs and felt that they became "lifeless or dead". She also developed diffuse headache, a feeling of dizziness and palpitations. Half an hour later she vomited seven ounces of "undigested food"; her colour was noted to be grey. She appears to have become semiconscious at this time. Her expression became vacant, she uttered odd cries, and she was said to be "stiff". The pupils still reacted to light; her face remained grey. Two hours after taking the powder her condition was worse. There was no response to painful stimuli, a variable divergent squint was present, and the pupillary reaction to light was just detectable. There was no conjunctival injection. Her face was ashen and cold with striking cyanosis of the lips; the pallor, coldness and cyanosis were all less obvious in the extremities. The pulse rate was 120 beats per minute, and the blood pressure 125/75 millimetres of mercury; jugular venous pressure was normal; there was no cardiac enlargement and no triple rhythm or bruit. Calf pressure produced no visible response. The abdomen was lax, and the wound was healing satisfactorily. No relevant pelvic abnormality was suspected by the gynæcologist. Examination of the chest revealed no abnormality; air entry on both sides seemed normal, although respiration was periodic and relatively shallow. Once a pharyngeal airway was inserted there was no sign of obstruction to breathing. Reflexes were brisk and the plantar responses normal; there was some spasticity of the upper limbs, occasional twitchings of which were the only movements observed for about two hours. No neck stiffness was present. The fundi were normal. Incontinence of urine and fæces developed over the next hour.

Intravenous "Coramine" (six millilitres) diminished the periodic nature of the breathing, and oxygen, previously being given at a low rate through a single intranasal catheter, was administered under pressure and with manual control in time with the patient's respirations. The extreme facial pallor and lip cyanosis persisted; colour and temperature changes were not, as before, very noticeable elsewhere. No improvement in the level of consciousness was apparent. The blood pressure fell to 110/75 millimetres of mercury, the lowest level reached, and the pulse, still of good volume, to 110 beats per minute. The foot of the bed was raised.

A diagnosis of pulmonary embolism was made at this stage with considerable misgiving for several reasons. In particular, concern was caused by the apparent disproportion between facial pallor and cyanosis and the signs of peripheral circulatory failure, and by the failure of adequate oxygen therapy to reverse the cyanosis, at least of the lips, in the absence of respiratory obstruction. A diagnosis of methæmoglobinæmia was considered and deliberately rejected because, on the information then available, no cause could be identified; it is fortunate that this fallacious approach did not have more serious results. The neurological signs were provisionally attributed to anoxia.

After a short period of intranasal oxygen, positive pressure artificial respiration with oxygen was recommenced almost four hours after the powder had been given. Although the clinical picture seemed unchanged up to that point, there was then dramatic improvement in her mental state. She spoke a few words in her native (European) language and recognized her husband. Within an hour the patient was conscious and reasonably rational. Although her face remained very pale the cyanosis had now decreased. The cardio-vascular signs were unaltered. By this time the fact that she had been given anti-rust powder had been established, although its composition could not be determined. In fact two possible formulæ obtained were subsequently proved incorrect. In view of her manifest improvement no further treatment was given other than to begin anticoagulant and antibiotic therapy. She began to take fluids orally.

Twelve hours after the "mixture" she was mentally normal, but felt tired and weak. Facial pallor was still marked, but cyanosis indefinite. Bilateral severe calf tenderness was present, but Homan's sign was negative and the superficial veins were not dilated. The blood pressure had risen to 160/80 millimetres of mercury, and her pulse rate, which had fallen about four hours earlier, remained steady at 80 beats per minute. The blood pressure fell within a few hours to 140/82 millimetres and subsequently ranged between 125/72 and 140/80 millimetres

[1] Sodium nitrite is now listed only in the British Pharmacopœial Codex.

of mercury, the pulse rate being unaltered. Her colour was normal by the next day, and the calf tenderness subsided over a week. No jaundice or pallor, or enlargement of the liver, spleen or glands developed. Recovery appears to have been complete.

Special Investigations.

No methæmoglobin was detected in blood taken about fifteen hours after the ingestion of the anti-rust powder. An electrocardiograph after 12 hours showed slight *ST* depression (about one millimetre) in leads AVF, V4, V5, and V6; this was not seen two days later. An X-ray picture of the chest, taken on a portable machine, at this time showed no relevant abnormality, and this was confirmed on more elaborate examination five days later. Daily tests revealed no albuminuria over the next week. A capillary fragility test gave a mildly positive result on the first day and subsequently. Serial total and differential leucocyte counts (Table I) revealed a transient leucocytosis.

TABLE I.

Results of Serial Blood Examinations.

	Number of Days after the Ingestion of Sodium Nitrite.						
	1	2	3	4	6	7	30
Total leucocytes per cubic millimetre ..	15,400	13,800	7600	7800	7000	11,600	7400
Polymorphs	50%	36%	53%	33%	46%	50%	—
Old metamyelocytes ..	10%	27%	13%	17·5%	16%	11%	—
Lymphocytes	34%	29%	19%	42%	31%	31%	—
Eosinophils	1%	1·5%	2%	3·5%	1%	1%	—
Monocytes	5%	6·5%	13%	4·0%	5%	6%	—
Basophils	—	—	—	—	1%	1%	—

The erythrocyte sedimentation rate on the first and sixth days was 27·5 millimetres and 25 millimetres in the first hour, an elevation attributed chiefly to the presence of calf thrombosis. Thirty days after the ingestion of sodium nitrite the hæmoglobin value was 12·6 grammes per 100 millilitres; the platelets numbered 317,000 per cubic millimetre.

The patient's relevant past history was as follows: For the previous eighteen months she had been attending a physician for treatment of backache, attributable to thoracic scoliosis and spondylitis, and for dyspepsia. Her blood pressure was usually 160 to 170 millimetres of mercury systolic, and 100 to 110 diastolic; she weighed about ten stone seven pounds. A blood examination six months before operation showed a hæmoglobin value of 13 grammes per 100 millilitres, and a white cell count of 9150 per cubic millimetre (polymorphs 55%, eosinophils 4·5%, monocytes 6% and lymphocytes 34·5%); at this time she had had some superficial abscesses complicating psoriasis. An X-ray examination of the chest revealed slight cardiac enlargement and widening of the aorta; the appearances in the recent films were unchanged.

Discussion.

The fact that anti-rust powder had been given to this patient was not known until it was apparent that she was recovering. The diagnosis of methæmoglobinæmia was dismissed too lightly, despite recognition of the classical sign of failure to become pink after effective oxygen therapy with a clear airway. This, the penultimate error in a series beginning some hours previously, might well have had serious consequences. The final error occurred in the search for the composition of a proprietary anti-rust powder in the early hours of the morning. A formula was obtained which contained only relatively harmless substances. When the manufacturer's agent was contacted he also gave, by mistake, an incorrect formula, but the error was quickly rectified. Mention is made of this uncertainty to emphasize the difficulty of obtaining information on the contents of proprietary preparations at a moment's notice. The problem has been tackled in some parts of the world by the establishment of "poison centres", functioning 24 hours a day, where the composition of a wide range of preparations and other information are always available.

The diagnosis in the present case depends upon the circumstances and clinical signs; methæmoglobin had disappeared from the serum by the time it was sought. Circulatory collapse is usually an outstanding feature of the clinical course in most recorded cases. In the present instance this was not severe, as indicated by the pulse, blood pressure, and, to a lesser extent, skin temperature (except of the face). Calculation using Starr's formula (1954) suggests that cardiac minute volume was high, being 6·5 litres when first seen, 4·25 litres when the blood pressure was at its lowest and 5·8 litres in the recovery phase. Approximately normal levels, similar to those recorded prior to operation, were reached after about eighteen hours. A rise in cardiac output is the usual result of ordinary doses, but the effects of nitrites on the circulatory system are complex, and some variability is to be expected from case to case when larger doses are taken. Respiratory depression, marked in this patient, is usually prominent. Earlier symptoms include headache, palpitations and vomiting. While the latter probably played a part in saving Mrs. A's life, recovery from such a large dose remains remarkable. It has been suggested that contact with body tissue in the presence of an alkaline medium (provided by the sodium carbonate) led to the oxidation of nitrite to nitrate, a reaction comparable to that of the mixed powder in its usual anti-rust role. On clinical grounds it would appear that absorption was rapid initially and later diminished.

In addition to the measures common to the treatment of most orally administered poisons, oxygen and intravenous methylene blue (one to two milligrammes per kilogram as a 1% solution) are required to combat anoxæmia and methæmoglobinæmia. The effect of methylene blue is usually dramatic. Occasionally exchange transfusion has been employed (Kirby, 1955). Blood transfusions may be given to raise the blood pressure. An essential part of the treatment of hypotension due to nitrites is to raise the foot of the bed to facilitate venous return. Because venous or post-arteriolar pooling, rather than arteriolar dilatation, appears to be the major factor in nitrite-induced circulatory collapse, Goodman and Gilman (1955) consider that vasopressor drugs are contraindicated, as venous return may be further decreased and the condition aggravated by arteriolar spasm. "Coramine" is a useful respiratory stimulant.

The pharmacology and toxicology of the nitrites are described by Goodman and Gilman (1955). References to reported cases are given by Barton (1954) and by Greenberg and others (1945). The substitution of sodium nitrite for table salt seems to have been the commonest method of ingestion. A case arising in this way, the source of the nitrite being an abattoir where it was used to preserve colour in curing meat, was described in Australia 25 years ago (Palmer, 1933). Its other uses are in the dye industry and as an anti-corrosive. According to Kirby (1955) it is becoming an increasingly common constituent of machine oil, the causative agent in his case. No case produced by oral anti-rust powder has been described, although Rozenfeld (1953) has recorded methæmoglobinæmia after the dressing of burns with "Zephiran" to which sodium nitrite had been added inadvertently. The present case is reported partly for this reason and partly to emphasize that many dangerous substances freely used in hospitals are not necessarily labelled "Poison". It has other lessons.

Acknowledgements.

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References.

BARTON, G. M. G. (1954), "A Fatal Case of Sodium Nitrite Poisoning", *Lancet*, 1: 190.

GOODMAN, L. S., and GILMAN, A. L. (1955), "The Pharmacological Basis of Therapeutics", 2nd Edition, MacMillan, New York.

GREENBERG, M., BIRNKRANT, W. B., and SCHIFTNER, J. J. (1945), "Outbreak of Sodium Nitrite Poisoning", *Am. J. Pub. Health*, 35 : 1217.

KIRBY, N. G. (1955), "Sodium Nitrite Poisoning Treated by Exchange Transfusion", *Lancet*, 1 : 594.

PALMER, A. A. (1933), "Fatal Poisoning by Sodium Nitrite", M. J. AUSTRALIA, 2 : 113.

ROZENFELD, I. R. (1953), "Methæmoglobinæmia Resulting from the Absorption of Sodium Nitrite", *J.A.M.A.*, 152 : 706.

STARR, I., SCHNABEL, T. G., ASHOUITZ, F. I., and SCHILD, A. (1954), "On the Relation Between Pulse Pressure and Cardiac Stroke Volume Leading to a Clinical Method of Estimating Cardiac Output from Blood Pressure and Age", *Circulation*, 9 : 648.

Reviews.

Handbook of Treatment of Acute Poisoning. By E. H. Bensley, M.B.E., B.A., M.D., F.A.C.P., and G. E. Joron, B.A., M.D., C.M., F.A.C.P.; Second Edition; 1958. Edinburgh and London: E. and S. Livingstone, Limited. 4½" × 7¼", pp. 224. Price: 15s. (English).

IN this new edition of Bensley and Joron's "Handbook of Treatment of Acute Poisoning" the authors, who are associated with McGill University and the Montreal General Hospital, indicate that the book is primarily a guide to treatment in acute poisoning. Although this is so, it contains much general information concerning the action of poisons and neutralizing agents and also gives a short account of symptoms. The first section of the book deals with basic principles and methods of treatment. The basic principles are presented briefly and include the control of the main effects of poisons, such as respiratory depression, shock and convulsions. Then follows a general plan of treatment, in which the authors explain the reason for dividing the treatment of poisoning into measures to be taken before and after the arrival of the physician. They advocate the giving of advice over the telephone regarding first-aid measures pending the arrival of the physician at the patient's home or the patient's arrival at a hospital. This preliminary treatment is described in general terms and is followed by a plan of treatment under immediate medical supervision and a description of the various types of drugs used in treatment. The second section consists of the detailed method of treatment of individual poisons or groups of poisons. The poisons are arranged alphabetically and the procedures in the treatment of each are set out in a definite order. The doses of the various drugs used are indicated in each case, so that the line of action is clearly defined without reference to previous sections of the text. The equipment and drugs required for an emergency poison kit are described in the appendix.

This book covers a wide range of poisons and gives the latest methods of treatment. Additional groups of drugs have been added in this edition. The only obvious omission is thallium, which is an important poison in this country, but evidently not common in the experience of the authors. For quick reference in the emergency treatment of poisoning, the book should prove extremely useful to the general practitioner and the hospital physician.

High Arterial Pressure. By F. H. Smirk, M.D., F.R.C.P., F.R.A.C.P.; 1957. Oxford: Blackwell Scientific Publications. 9¾" × 6", pp. 910, with many illustrations. Price: 75s. (English).

IN Australia and New Zealand, Professor Smirk has been known for many years as the outstanding exponent and indeed the originator of the treatment of high blood pressure with methonium compounds. His reputation in this field is, of course, world wide, and his new book on high arterial pressure comes up very well to expectations.

The plan of the book follows conventional lines. The early chapters deal with measurement of blood pressure, the natural history and ecology of high and low blood pressure, clinical manifestations and ætiology. Then follow excellent chapters on the physiology of blood-pressure regulation and on experimental hypertension. After chapters on the pathogenesis of human hypertension and its prognosis, the author comes to that part of the subject which has been his particular interest—the treatment of high blood pressure. This occupies more than 300 pages and is undoubtedly the best and most comprehensive account of treatment available. The author has reviewed the results with practically every preparation or procedure so far used and in so doing provides an historical perspective which will be most valuable to the younger reader. In the old days many a man passed unhappily to his grave having been advised "retirement, change of occupation, celibacy, no parties, no cinema, no alcohol, no tobacco, no meat, no salt, no spicy food, no lively interests, bed at 9 p.m. and for pleasure a therapeutic walk at a measured pace"!

The book contains a first-rate account of the pharmacology of the rauwolfia alkaloids and the methonium compounds, which taken together the author regards as the best combination in the treatment of well-established hypertension. Indications for treatment and details of management are discussed very fully, and few will find much to quarrel with. Smirk emphasizes once again that old age, lack of intelligence or enthusiasm and a neurotic personality argue against the use of ganglion blockade, but points out the advantages to be gained by meticulous attention to detail in patients who merit treatment. Until something better comes along, physicians must continue to use ganglion blockade. As a reference in their initial difficulties this book is unsurpassed. For some perhaps it is far too long, but it is a most valuable compendium on modern knowledge of high arterial pressure.

Books Received.

[The mention of a book in this column does not imply that no review will appear in a subsequent issue.]

"Principles of Internal Medicine", edited by T. R. Harrison, R. D. Adams, I. L. Vennett, jnr., W. H. Resnik, G. W. Thorn and M. M. Wintrobe; Third Edition; 1958. New York, Toronto, London: McGraw-Hill Book Company, Incorporated. 9¾" × 7", pp. 1844, with many illustrations. Price not stated.

Written for the medical student and the practising doctor.

"Physical Diagnosis", by F. Dennette Adams, M.D.; Fourteenth Edition; 1958. Baltimore: The Williams and Wilkins Company. 10" × 6½", pp. 944, with many illustrations. Price: £6 12s.

The first eleven editions of this work were by Dr. Richard C. Cabot. The present author has produced all subsequent editions.

"The Medical Annual: A Year Book of Treatment and Practitioners' Index", edited by Sir Henry Tidy, K.B.E., M.A., M.D., F.R.C.P., and R. Milnes Walker, M.S., F.R.C.S.; seventy-sixth year; 1958. Bristol: John Wright and Sons, Limited. 8¾" × 5½", pp. 638, with illustrations. Price: 42s. (English).

An old friend in an improved form.

"Manual of Medical Emergencies", by Stuart C. Cullen, M.D., and E. G. Gross, M.D.; Third Edition; 1958. Chicago: The Year Book Publishers, Incorporated. Melbourne: W. Ramsay (Surgical), Limited. 7" × 4½", pp. 302, with many illustrations. Price: £3 3s. 3d.

A book for the general practitioner.

"Ciba Foundation Colloquia on Ageing: Water and Electrolyte Metabolism in Relation to Age and Sex", edited by G. E. W. Wolstenholme, O.B.E., M.A., M.B., B.Ch., and Maeve O'Connor, B.A.; 1958. London: J. and A. Churchill, Limited. 8" × 5", pp. 340, with 85 illustrations. Price: 45s. (English).

The fourth colloquium in the Ciba Foundation's programme for "the encouragement of basic research relevant to processes of ageing", initiated in 1954.

"Cholesterol", by David Kritchevsky; 1958. New York: John Wiley and Sons. Incorporated. London: Chapman and Hall, Limited. 9" × 5½", pp. 306. Price: $9.75.

This book is described as providing "a centralized source of information on the biological function and significance of cholesterol".

"The Clinical Examination of the Nervous System", by G. H. Monrad-Krohn, M.D., F.R.C.P.; Eleventh Edition; 1958. London: H. K. Lewis and Company, Limited. 8¾" × 5", pp. 486, with 173 illustrations. Price: £2 (English).

The first edition appeared in 1921. It is fully revised in this edition.

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HOSPITAL AND COMMUNITY.

ELABORATE INSTITUTIONS for the preservation and restoration of community health are not new. They are found to have existed in two widely separated epochs of the long-distant past. Like the noble constructions of present-day design, they were conceived on a magnificent scale, served all members of the community, irrespective of class, colour or creed, were training centres for recruits to the medical profession, and were substantially supported by the holders of the national purse. In certain respects they were essentially different from the hospital systems of the Western world, which came into existence as the outcome of a mediæval conception of Christian charity sponsored by the Church for the sole benefit of those sufferers among the lower classes who were homeless, destitute or hopelessly infirm.

The first and most famous of the ancient "health centres" was the Asklepion at Epidaurus; it belonged to the Greek classical period, and was delightfully situated among wooded hills and verdant groves on the peaceful shores of the Ægean Sea. Here, supernatural agencies dependent on religious belief were helpfully supplemented by the rational healing methods of the guild of Asklepiads, who had been instructed and trained in the art and science of medicine at a school set up within the sacred precincts of the temple. The benefits to be derived from varying periods of hospitalization were made available to some six thousand inmates from all parts of the Grecian world without any distinction as to rank, financial status or social level in society. Those in need of active medical treatment were admitted to the wards, while others were accommodated in hostels to spend their convalescence and to find mental relaxation in agreeable occupations provided at the gymnasia, the public baths, the stadium or the theatre, where seating accommodation was available for over twelve thousand spectators. At Epidaurus untold wealth was expended by the nation to ensure that the richest talent in Greek art, science and medicine was employed in offering due homage to the deity, as well as giving an efficient and attractive health service to the community.

Many centuries later an energetic race of people under the banner of a new religion became ultimately so familiar with Greek science and tradition that in the course of time they established a number of magnificent "health centres" throughout their wide Empire—at Bagdad, Cordova, Damascus and Cairo. It was all done in the name of Allah, the one merciful and all-powerful God, while the tolerant Islamic faith encouraged its adherents to study all that was best in Greek medicine and to teach its principles in the medical schools attached to the various hospitals, which were open to all classes of the community without discrimination. Human dissection was forbidden by the Koran, but apparently no objection was taken to original research carried out with the help of comparative anatomy, for by this means a distinguished physician, who was trained at Damascus and later taught in the great Al-Mansur hospital at Cairo, was able to give the earliest accurate description of the pulmonary circulation—to be plagiarized three centuries later by a Renaissance scholar who was familiar with Arabic medical texts. In the Cairo hospital there was a mosque, a medical school, a trained medical staff duly qualified by examination and holding a licence to practise, male and female nurses, separate wards for men and women and a special fund set aside for the support of poorer patients until such time as they were well enough to resume their usual occupations. Also there were libraries, diet kitchens, supervising officials versed in the rules laid down for hospital administration, out-patient clinics, an ophanage, fountains playing in the four courtyards and pharmacies where medicines were dispensed free of cost.

Once again, after another lapse of many centuries, we are reverting to the large-scale establishments of ancient times. Vast sums of money are required to build and maintain them, from fees paid by patients in the general, intermediate and private sections of the hospital, from voluntary contributions and from large grants of financial aid provided annually from the public treasuries. How the modern hospital system in Australia was evolved from the early ideal of Christian charity, through the eighteenth century humanitarian movement with its foundation of English voluntary hospitals, to the colonial civil institutions which came into existence at the end of the convict transportation era, culminating with the inevitable reforms demanded by the efflorescence of modern science and technology, is admirably told by K. S. Inglis in his illuminating history of the Royal Melbourne Hospital at Parkville.[1] This work is of singular merit and seems to be outstanding among books that have so far been written about the history of individual hospitals. It is notable for the comprehensiveness of its survey, for a unique method of presentation, for the emphasis placed upon the economic problems of hospital administration, and for the vivid background of medical, social and political developments which over the last century have helped to convert this modern health centre from "a refuge and resting-place for hundreds who but for such institutions must die in the streets and doorways" to the present colossal undertaking with Commonwealth and State governments taking a large share of responsibility for maintaining its valuable services as an important national asset. It is now provided with exceptional facilities for the encouragement of original research, for the special training of nurses, for higher post-graduate education, and for the thorough

[1] "Hospital and Community: A History of the Royal Melbourne Hospital", by K. S. Inglis; 1958. Melbourne: Melbourne University Press. 8½" × 5", pp. 236, with illustrations. Price: 30s.

clinical instruction of medical students by reason of its close structural and functional relationship with the medical school and the University of Melbourne.

When the Melbourne Hospital first opened its doors for the reception of patients in March, 1848, a new era in scientific medicine had just dawned with the introduction of general anæsthesia—an innovation which was taken up with more or less enthusiasm by leading doctors on the hospital staff. Slower in acceptance were the new principle of antiseptic surgery enunciated by Joseph Lister in March, 1867, the Nightingale system for training of nurses, and the obligation to shoulder responsibility for the clinical instruction of medical students enrolled at the University of Melbourne. In the early days of the hospital little heed was taken of outside community affairs; the doctors for the most part were confirmed individualists with a conservative outlook in their reactions to novelty and change. The committee of management was frequently embroiled in local controversies, difficult situations arising out of financial crises or the continued outbreak of erysipelas in the wards, while outspoken medical students and their teachers periodically expressed dissatisfaction with the hospital's apparent indifference to the need for systematic clinical instruction in preparation for a searching degree examination at the end of the course.

The whole picture of hospital care has changed over the last half-century. The modern teaching hospital embodies all that is latest and best in medical art, science and technology. Instead of selfish individualism the emphasis is on helpful teamwork and cooperation in all the highly specialized departments of medicine and surgery, the needs of medical students and post-graduates for study and training are appreciated, and, to replace the time-honoured electioneering intrigues, there is a properly constituted body for the appointment of specialists to the hospital staff. It is now a commonly accepted fact that all governments as well as the people they represent feel a real concern for the economic and functional stability of an institution which is recognized as essential to the positive health and general welfare of the whole community. The Royal Melbourne Hospital is one such institution. The vision apparent in its plans for future development make the history of its next one hundred years something exciting to contemplate.

Current Comment.

MENTAL HEALTH ASPECTS OF THE PEACEFUL USES OF ATOMIC ENERGY.

THE World Health Organization has released the findings of a Study Group called to advise the Director-General of WHO on the mental health aspects of the peaceful uses of atomic energy. Participating in the Group were representatives of disciplines as different as psychiatry, atomic and radiation medicine, public health, social anthropology and science journalism. They examined reports from all over the world on the emotional impact of atomic energy developments as reflected in everyday life, public statements, the Press and letters to atomic, health, political or religious bodies, as well as the results of clinical inquiries. They express the view that, in the minds of people everywhere, atomic energy remains a threatening and mysterious force, interpreted very often in magical rather than rational terms, and fraught with irrational fears and irrational hopes of serious social and individual consequences. In contrast to the tremendous scientific and technical achievement of atomic science today—the intellectual or vocational prerogative of a few—the great mass of people, according to the Study Group, belong to the "childhood of mankind" and retain a fear of the consequences of presumption in interfering with things that are too high for them. From the point of view of individual development, being a child means being helpless and dependent upon powers that seem capable of giving almost infinite benefits or ultimate punishment. Children who come into conflict with power are prone to have fantasies of the most destructive kind. Even adults, in an emergency, can relapse into primitive forms of thought and feeling—and that is characteristic of much of the psychological reaction of people to nuclear energy. On the question of harmful effects of radiation on brain function, data are scanty. However, work has shown that, though nervous tissue is among the most resistant of all tissues, it can be severely damaged by high doses of radiation which the subject can still survive. Experimental work on animal embryos and young animals has confirmed the radiosensitiveness of nervous tissues during the developmental period. The adult brain, however, is exceptionally resistant to radiation. "The conclusion to be drawn is that with the low dosages of radiation to be encountered in the peaceful uses of atomic energy, the organic brain effects so far observed are of minor or no importance."

Dealing with another type of stress associated with the advent of atomic energy, the report states that in advanced countries, a second industrial revolution may interfere with whatever social equilibrium and stability has been achieved, often at great cost. This is particularly so if it is added to other recent technological innovations which have accelerated the pace of change; "societies have a certain threshold of tolerance for rate of change which, if exceeded, leads to some measure of social disorganization". Even greater concern is expressed about the effect upon the so-called under-developed areas, where the advent of atomic energy, to the extent that it accelerates the process of industrialization, can bring an increase in existing social problems. There are still other dangers: "Where exaggerated hopes have been aroused, there may be disappointment when nuclear installations do not prove feasible or do not produce at once a miracle in the form of a higher stndard of living. . . . The repercussions from eventual disappointment may be severe and take the form of hostility against those populations which draw major benefits from atomic energy."

The relations of the scientists to the politicians also generate anxiety, because of the uncertainty as to who wields the power and how. "In one sense, the political leader has power over the scientist. But in another, he is dependent upon the scientist, and hence in his power. . . . The advent of nuclear power has taken the ultimate strength out of the hands of services which are under political control and placed it in the hands of the scientist. . . . The scientist is a civilian and not in the direct service of the State, and in his role of scientist owes his first allegiance to scientific truth. No social institutions have been developed to hold him individually in thrall to the civilian power; as a scientist he has had no special training in discipline and obedience. It is not unnatural, therefore, that political leaders sometimes develop intense hostility to the scientists and so promulgate unrealistic decisions in attempts to control the scientific situation in the teeth of the scientists." It is pointed out that few, if any, political leaders have had scientific training to enable them to see the ultimate implication of scientific work. The effect is general bewilderment and "a suspicion that the political leader, instead of being master of the situation, is, in fact, caught between the scientist and the next election". This relationship obviously requires serious study.

Since the public mainly learns about atomic developments from the Press, the role of the journalist is very important. The experts were impressed by the general standard of integrity with which journalists handled

atomic energy news. Yet this news was often regrettably presented under scare headlines, which left an enduring impression, even if the substance of the story was sober and even reassuring. The report states that the tacit newspaper principle is that "bad news is good news", and this has profund implications for mental health and morale.

The WHO experts consider that the complexity of underlying emotions in the changing environment of the second industrial revolution brought about by the atomic age need to be recognized more widely among leaders of thought and action. The first task seems to be to establish what may be termed a culture of change, in which change and reorientation can take place without upheaval. The chief effort would have to be directed towards securing for adults a greater intellectual grasp and thus a better understanding of the new situation. The Group suggests, however, that the main duty of the present generation is towards its children. Their upbringing must enable them to put up with insecurity and to face reality. This upbringing must be free from anxiety and hate, producing in individuals self-reliance and a sense of responsibility towards others. And those who hold responsible positions in public life—doctors, teachers, the clergy, the authorities—must be educated in mental health requirements. As regards local action, the Group has discussed a draft plan for the education of the community in matters pertaining to atomic energy. In essence, the idea is to form small teams, consisting, for example, of a psychiatrist, a psychologist, a sociologist and a journalist, to study local conditions and contribute to the planning of new atomic enterprises and also to their acceptance by the people. A number of specific suggestions are also made concerning research and work to be done in connexion with mental health and atomic installations, the production of atomic power, and medical use of radiation.

In conclusion, the Group states that its findings are in no way alarming. It is, however, convinced that they are concrete enough to warrant the attention of those in authority. It hopes that persons in authority will be prepared to accept its conclusion that the behavioural sciences can make a valuable and concrete contribution to the adaptation of mankind to the advent of atomic power, making it indeed as painless and harmless as possible and allowing man to reap a rich harvest from the seed his inventive genius has sown.

DRUG ADDICTION IN EASTERN MEDITERRANEAN COUNTRIES.

WE are fortunate that drug addiction is not a serious problem in this country, but widespread addiction to hashish and opium and its derivatives is still a serious problem in certain countries of the Eastern Mediterranean Region. A subcommittee of the Regional Committee for the Eastern Mediterranean of the World Health Organization, meeting recently in Geneva, approved a resolution "noting with concern that in spite of all efforts to suppress addiction to drugs and to eliminate its causes, the problem remains acute". The subcommittee also requested the Regional Director "to give technical assistance to governments on request, in their efforts to suppress drug addiction".

Before taking this decision, the subcommittee had discussed two important papers. In the first of these, Dr. Tigani El Mahi, psychiatrist to the Clinic for Nervous Disorders, Khartoum, Sudan, dealt particularly with psychological aspects of hashish addiction. He stated that in some parts of the Middle East, owing to peculiar historical and social legacies, the people had developed an unhealthy fatalistic attitude towards life—a state of lethargy coupled with an ardent desire for stimulation of any kind. It was in such communities that the urge for euphoric stimulation was greatest. That urge was met by hashish. The second document was prepared by Dr. W. F. Ossenfort, WHO consultant, who was sent to Iran in connexion with a survey of the opium question. His opening paragraph commented: "October 7, 1955, is a significant date in the history of Iran. On that date the Anti-opium Law was enacted." He went on to state that prior to that date the growing, cultivation and harvest of opium had been a significant feature of the economy of the country. Twenty-five thousand hectares of fertilized irrigated land were devoted to opium production. The production approached 1000 tons a year. Only about 90 tons were exported, so there was really a lot of opium consumed by the population of the country. It was estimated that about a million and a half persons in Iran were addicted to opium. He emphasized that Iran's Minister of Health recognized that addiction to opium was a medical problem, and that addicts should receive treatment and not be treated as lawbreakers. The total accomplishments to date had been most significant. Poppy culture had been stopped. Smuggling had been controlled to the point where the cost of contraband opium was about forty times that of opium available before the enactment of control legislation. The number of addicts had been reduced by more than 80%. The accomplishments of Iran to date served as an excellent example of what could be done by a country that made a sincere and continuing effort. One of the most striking effects of the opium control programme in Iran had been the marked reduction in numbers of cases of acute opium poisoning with suicidal intent. In one city, suicidal attempts by opium had been at the rate of four a week; now the rate was one per month. In another, the rate had been three per day; now it was one per week. What was even more interesting was that there had not been a shift to other methods of suicide.

After taking note of this report, the subcommittee noted with appreciation the effective action on the part of the Government of Iran in controlling the production and import of opium and in the treatment of addicts. It then adopted its resolution reaffirming the necessity for international cooperation in order to bring to a successful conclusion the efforts undertaken to suppress drug addiction, and to carry out essential studies of the environmental conditions and the important social, cultural and racial factors which predispose to drug addiction.

SOME MAJOR GRANTS FOR AUSTRALIAN MEDICAL RESEARCH.

FROM two different sources major grants have been recently made to medical research in Australia. The Wellcome Trust has, so far as we know, not previously made grants of this character in Australia, but it has entered the field with two handsome gifts. The Institute of Medical Research at the Royal North Shore Hospital of Sydney receives £17,000 (sterling) to build and equip laboratories for experimental medicine and surgery. The University of Western Australia receives £50,000 (sterling) for the endowment of a Wellcome Research Department of Pharmacology. These are worthwhile gifts from a Trust which has done a great deal for medicine, and we hope that they are the forerunners of many more.

The other grant is an amount of £35,000 from the Life Insurance Medical Research Fund of Australia and New Zealand to support research into heart disease. It brings to a total of £170,000 the amount given for this purpose by the fund since its inception six years ago. The money will be spread among four research units in New South Wales, five in Victoria and two in New Zealand. In announcing the grant, Mr. Charles A. Ralph, Chiarman of the Life Offices' Association for Australasia, pointed out that almost six of every ten deaths in Australia last year were caused by diseases of the heart and circulatory system. The Life Offices' Association for Australasia maintains the research fund to enable its members to play their part in working for a reduction of the death roll from this cause, and so makes a significant and much appreciated contribution to medical research in this country.

Abstracts from Medical Literature.

BIOCHEMISTRY.

Cobalamin.

S. R. WAGLE *et alii* (*J. Biol. Chem.*, January, 1958) have reported on the relation of cobalamin to protein synthesis after producing cobalamin deficiency in baby pigs and rats by dietary means. These deficient pigs and rats were found less able to incorporate activity from injected uniformly-labelled glucose and B-labelled serine into liver proteins. Microsomal preparations from cobalamin-deficient rat liver and spleen were found to incorporate less labelled methionine, alanine or phenylalanine into protein than were preparations from normal animals. The addition *in vitro* of cobalamin to such preparations markedly increased the amount of amino acid incorporation. The incorporation of radio-phenylalanine in the presence of 19 other amino acids was much greater than when a single amino acid was studied, indicating a requirement for a pool of amino acids and strongly suggesting a net synthesis of protein. Here again the marked effect of cobalamin was obtained. A subcellular distribution study of vitamin B_{12} labelled Co^{60} administered to a rat showed it to occur principally in the microsome supernatant fraction.

Catecholamines.

G. ROSENFELD *et alii* (*Arch. Biochem.*, March, 1958) have shown that perfusion of the intact, isolated calf adrenal gland with a well-oxygenated artificial medium containing various C^{14}-labelled precursors permitted the recovery of large amounts of labelled norepinephrine and epinephrine. The findings demonstrated that the adrenal gland can autonomously perform all the reactions required for the biosynthesis of these catecholamines (starting with dietary tyrosine). The hydroxylation step essential for the conversion of tyrosine to DOPA appears to be the rate-limiting reaction in the over-all sequence. Norepinephrine was converted to epinephrine if a suitable methyl donor, namely methionine, formate or formaldehyde, was provided. The isolated gland did not utilize choline for N-methylation nor did it utilize demethylate epinephrine to form norepinephrine. Despite an active oxidative metabolism, glands perfused anaerobically formed 86% less labelled norepinephrine from DOPE-C^{14}, and 97% less labelled epinephrine from methionine-methyl-C^{14} than control organs perfused aerobically. There are marked differences in the turnover rate and hormonal biosynthetic activity of the bovine medullary and cortical tissues.

Phosphate Exchange.

H. G. MCCANN AND E. H. FATH (*J. Biol. Chem.*, April, 1958) have used simultaneously fluoride ion and P^{32}. They have shown that fluoride ion increases the rate of exchange of P^{32} with synthetic hydroxylapatite, human enamel and dentine, and rat dentine and bone. The rate is also increased by the presence of fluoride ion in the buffer when enamel, dentine and bone have been previously treated with fluoride either *in vivo* or *in vitro*. The rate of exchange of P^{32} with previously fluoridated enamel, dentine or bone, compared with the corresponding untreated control, is decreased. They have also presented additional evidence for the formation of fluorapatite in mineralized tissues. The exchange of P^{32} with synthetic hydroxylapatite and powdered defatted enamel, dentine and bone has been studied over a period of 110 to 140 days. Although the surface area of fresh and ashed bone is approximately the same, P^{32} exchange with the ashed bone is practically complete in 48 hours, whereas with unashed bone a period of over a month is required before the exchange approaches completion. It is suggested that diffusion of ions through the organic matrix of dentine and bone is an important factor in the rate of exchange with fluoride ion and radioactive isotopes.

Tyrosine.

O. E. MCELROY *et alii* (*Arch. Biochem.*, May, 1958) have continued studies on the effect of shock on tyrosine metabolic products. Tourniquet injury in rats produces an inhibition of the tyrosine oxidizing system in rat liver. There is an accumulation of p-hydroxy-phenylpyruvate and an increased requirement for ascorbic acid. The accumulation is not due to an inactivation of one of the enzymes of the system. The effect is due to a large polar molecule, unstable at —1° C. but stable when frozen. Half the enzyme present in the extract can be separated from this material by an electrophoretic fractionation. The substance is not affected by dialysis or precipitation with alcohol or acetone.

Vitamin E.

G. F. AZZONE AND M. ALOISI (*Biochem. J.*, June, 1958) have made muscle extracts at high ionic strength from E-vitaminotic rabbits. The extract has been divided into three fractions corresponding (*a*) to actomyosin, (*b*) to myosin, and (*c*) to the proteins salted out from the supernatant at 48% ammonium sulphate saturation. Total extractable proteins are decreased in dystrophy and the proportions of the three fractions are also changed. The first fraction, which is normally precipitated as actomysin by the splitting of ATP, has mainly the physico-chemical properties of myosin in subdystrophic animals, whereas in fully dystrophic rabbits the viscosity and potassium chloride solubility properties are those of actomyosin. Salting out and electrophoretic patterns of this fraction in advanced dystrophy also show a marked decrease of myosin content, and an unknown component appears which has a slower electrophoretic mobility and precipitates at lower ammonium sulphate saturation. The second fraction still retains its myosin properties in subdystrophic rabbits, but in advanced dystrophy several changes take place; a decrease in viscosity, in potassium chloride solubility and adenosine triphosphatase activity. These effects are to be correlated with the disappearance of myosin as shown by salting-out and electrophoretic experiments; the latter indicate also that in this fraction the unknown component which is precipitated at 12% to 14% saturation with ammonium sulphate predominates and has a very low electrophoretic mobility. Under normal conditions the third fraction contains, amongst other components, tropomyosin and Y-protein, but in dystrophic rabbits these proteins have a strong tendency to unite in rather stable complexes which probably include tropomyosin. Fractions I and II show a high content of ribonucleic acid in advanced dystrophy.

Deoxycorticosterone.

G. LESTER *et alii* (*Arch. Biochem.*, May, 1958) have studied the effects of 33 steroids on the growth of the mould *Neurospora crassa*. Of these, deoxycorticosterone (DOC) showed a marked and relatively specific inhibitory effect. It has also been shown that DOC inhibits the uptake of sugars, amino acids and rubidium. The results obtained suggest the possibility that the action of DOC is directed against certain permeability processes of the Neurospora cell.

Cholesterol Absorption.

W. WELLS AND S. COOPER (*Arch. Biochem.*, May, 1958) have demonstrated that rats fed on diets containing 40% lactose for five days exhibited higher total liver cholesterol values than controls fed on a basal sucrose diet. Lactose-supplemented diets markedly reduced the formation of coprostanol, suggesting a possible relationship between this finding and cholesterol absorption. Quantitative balance studies demonstrated the absorption of 40·4% of administered cholesterol by sucrose control, in contrast to 66·2% of the same dose by lactose fed rats. Both 2% and 4% calcium chloride inhibited cholesterol absorption when the diet was supplemented with lactose, while as much as 4% calcium chloride was required to produce a similar effect on a sucrose diet. Calcium ion in the form of 2·2% calcium carbonate was less inhibitory than 2% calcium chloride, and 2·7% potassium oxalate overcame the action of 2% calcium chloride. Calcium chloride has no effect on cholesterol absorption when added to fat-free diets containing bile salts.

Thyroid.

G. LITWACK (*J. Biol. Chem.*, March, 1958) has reported that thyroid hormone inhibits kidney lysozyme activity *in vivo*. A similar inhibition occurs in animals which have been thyroid-parathyroid-ectomized. The decrease in activity appears to represent a change of state of the enzyme as shown by basing enzyme activity upon tissue deoxyribonucleic acid concentration. Under identical conditions the state of the spleen enzyme has been shown to remain essentially constant.

Iron.

J. A. E. HALKETT *et alii* (*J. Biol. Chem.*, March, 1958) have studied the iron metabolism of the laying hen by the use of radioactive iron (Fe^{59}). Allocation of iron between haemoglobin and egg yolk formation was observed, both upon initial injection and upon subsequent breakdown of red cells at the end of their normal

life span. The processes of formation of hæmoglobin and egg yolk apparently both draw upon the plasma iron pool. The average red cell life span for the small (0·9 kilogram) hens studied was found to be 24 days. Radioautographic studies have shown that iron is deposited in egg yolks in a concentric manner and that iron deposited in egg yolks does not exchange with plasma iron. Chemical studies on egg yolks, including those containing tracer iron, indicate that iron in egg yolk is in the ferric state, that it is not held in specific organic combination, and that its properties are due mostly to a strong binding by the phosphoprotein present.

Œstrone.

H. WOTIZ *et alii* (*J. Biol. Chem.*, April, 1958) have studied the metabolism of œstrone. Plasma obtained from rats after short-term infusion of œstrone-16-C^{14} was dialysed against aqueous methanol and against saline. No evidence could be obtained for the binding of œstrogen to plasma proteins. Little, if any, conjugation of œstrogen to inorganic acids or glucuronic acid could be detected. Evidence was obtained for the rapid degradation of ring D of œstrone-16-C^{14}. Œstradiol was found in the extracts. Suggestive evidence for œstriol was also found.

PHYSIOLOGY.

Severe Burns and Steroid Excretion.

N. I. GOLD *et alii* (*J. Clin. Investigation*, June, 1958) studied the rate of urinary excretion of tetrahydrocortisol, allo-tetrahydrocortisol and tetrahydrocortisone. After the administration of intravenous ACTH in normal subjects, and after the trauma of surgery or severe burns, these workers observed not only a rise in the rate of excretion of each metabolite but also a rise in the ratio of tetrahydrocortisol to tetrahydrocortisone. In the case of those patients who suffered from severe burns, this ratio rose to very high levels shortly before death, suggesting some inhibition in the conversion of cortisol to tetrahydrocortisone. The authors suggest that trauma in man can lead to changes in the metabolism of cortisol.

Neurohypophyseal Function.

J. F. DINGMAN *et alii* (*J. Lab. & Clin. Med.*, May, 1958) studied the release of antidiuretic hormone in two patients with Sheehan's syndrome. These studies support the hypothesis that the absence of polyuria in certain patients suffering loss of anterior and posterior pituitary lobes is due to the capacity of the hypothalamus to produce some antidiuretic hormone, even in the absence of the posterior lobe. At least one adenohypophyseal hormone (namely ACTH) must be present for diabetes insipidus to occur. The authors produce data which indicate that ACTH acts by stimulating the secretion of glucocorticoids, which in turn promote diuresis by inhibiting the release of antidiuretic hormone from such neurosecretory tissue as survives. The mechanism of this inhibition is obscure but does not depend upon the osmotic pressure of the extracellular fluid.

Blood Changes after Injection of Dextran.

R. L. SWANK (*J. Appl. Physiol.*, January, 1958) reports that injections of dextran into dogs are followed by aggregation of the red blood cells and slowing of the circulation by the formation of an amorphous film enveloping the red blood cells and by the presence in the blood of many small irregular red cells. Simultaneously, the platelet and white blood cell counts decrease in number, there is a decrease in fibrinogen in the venous blood, and there are changes in the erythrocyte sedimentation rates and increases in the clotting time and in blood viscosity. After a variable period these changes all return to normal.

Plasma Adrenaline and Noradrenaline in Electroshock Therapy.

R. L. GRISWOLD (*J. Appl. Physiol.*, January, 1958) reports that the plasma concentrations of adrenaline and of noradrenaline and their changes after electroshock therapy have been determined in psychiatric patients and in rats. Electroshock therapy was found to cause a transient elevation in both adrenaline and noradrenaline. Pretreatment with barbiturates and with ganglion-blocking agents was found to suppress completely the adrenaline and noradrenaline responses. Pretreatment with succinylcholine caused a partial inhibition. Preoxygenation caused no alteration in response to electroshock therapy. A significant degree of depression of the noradrenaline response after a series of electroshock treatments was seen in human subjects.

Metabolic Response to Hypothermia.

D. H. HENNEMAN, J. P. BUNKER AND W. R. BREWSTER, JUNIOR (*J. Appl. Physiol.*, March, 1958) report that the total body cooling in man to 28° to 30° C. during thiopentone-curare anæsthesia and hyperventilation was associated with arterial blood electrolyte changes similar to those observed during respiratory alkalosis without hypothermia. Metabolic alterations reflected in part the changes expected during alkalosis, but suggested in addition an inhibition of the tissue uptake of glucose and its subsequent glycolysis. Metabolic acidosis did not occur during uncomplicated hypothermia; however, shivering, occlusion of major blood vessels and the transfusion of routinely collected blood led to moderate to severe metabolic acidosis.

Depot Fat Depletion after Thermal Trauma.

S. W. MILSTEIN AND R. E. COALSON (*Am. J. Physiol., April, 1958*) report that the effects of moderate to lethal thermal injury by water scalding on the degree of peripheral body fat depletion in the rat were studied by the direct measurement of changes in the fatty acid content of a characteristic depot. After a non-lethal burn, loss of fat and body weight was consistently less than in pair-fed controls for about one week. Later phases of this post-burn period indicate that the normal capacity to deposit fat is not restored in burned rats during the interval when pair-fed mates reach control levels. In a lethal burn, fat depletion is rapid and extensive, despite a normal intake of food that permits pair-fed controls to resume normal lipid economy.

Protection against Lethal Irradiation.

D. F. BOHR *et alii* (*Am. J. Physiol.*, April, 1958) report that rats subjected to 650*r* whole body irradiation were protected by shielding with small lead shields either skin or muscle tissue to about an equal extent in each case. Shielding both tissues virtually doubled the protection. It is suggested that this ability to protect against the lethal effects of whole body irradiation is not necessarily related to the primary physiological function of the shielded tissue, but may be a potentiality of any unirradiated cell.

Factors in the Induction of Atrial Fibrillation.

W. C. HOLLAND AND B. TINSLEY (*Am. J. Physiol.*, May, 1958) report that a study of fibrillation induced in isolated rabbit atria by stimulation at high frequencies (600 to 1200 cycles per minute) in the presence of acetylcholine revealed it to be dependent on the ionic composition of the medium. The effects of varying the sodium, potassium and calcium ion content of the bath fluid on the incidence of fibrillation are interrupted on the basis that fibrillation begins only at a time when the trans-membrane flux of sodium and potassium ions exceeds a critical rate. Evidence is presented that the initiation and maintenance of fibrillation are governed by separate physicochemical processes. The onset of fibrillation results from a sudden transient increase in cell membrane permeability. This latter reaction sets off other biochemical processes which maintain the phenomenon.

Intestinal Weight Changes in Hæmorrhagic Shock.

P. C. JOHNSON AND E. E. SELKURT (*Am. J. Physiol.*, April, 1958) report that the weight of a segment of small intestine was continuously measured in dogs during a standardized hæmorrhagic shock procedure. In 11 out of 17 experiments, intestinal weight decreased during hæmorrhagic hypotension, while in the remaining six an unequivocal increase occurred. The magnitude and the direction of these changes were not correlated with changes in portal venous pressure. In late stages of hypotension a small rise in intestinal weight and in portal pressure was observed. On transfusion, intestinal weight increased further, and in 13 out of 17 experiments exceeded control levels. There was a small continuing increase of intestinal weight in most of these preparations as shock developed. This weight increase was correlated with the accumulation of sloughed mucosal cells and blood in the lumen of the intestine. In the four experiments in which intestinal weight did not reach control levels with reinfusion, there was a further reduction of weight as the animals went into shock. It is concluded that intravascular pooling of blood in the intestine is not a necessary feature of hæmorrhagic shock.

Congresses.

THE SIXTH INTERNATIONAL CONGRESSES ON TROPICAL MEDICINE AND MALARIA.

THE Sixth International Congresses on Tropical Medicine and Malaria were held on September 5 to 13, 1958, at the newly built Institute of Tropical Medicine, Lisbon, Portugal. The President of the Congresses was Dr. J. Fraga de Azevedo, and the General Secretary was Professor M. R. Pinto. Members of the Congresses came from 56 countries. Australian members included Dr. A. H. Baldwin, Dr. E. Beatrix Durie (representing the University of Sydney) and Professor N. F. Stanley (representing the University of Western Australia).

The scientific material was presented in two divisions: Division A, tropical medicine; Division B, malaria. Division A had seven sections, as follows: (i) helminth infections, (ii) protozoal infections, (iii) bacterial and mycotic infections, (iv) virus and rickettsial infections, (v) tropical physiology, (vi) tropical hygiene and sanitation, (vii) general. Division B had the following sections: (i) parasitology, (ii) clinical, (iii) epidemiology and problems of control, (iv) malaria eradication. Abstracts of the papers read have been published in a special volume.

The Committee on Resolutions met on September 12, under the chairmanship of Professor A. Dubois, and drafted 15 resolutions, which were adopted by the final meeting of the Congresses on September 13. The resolutions were to the following effect:

1. *Establishment of the International Interim Committee*: A committee with the following composition was appointed to prepare the seventh congresses: Australia, one representative (Professor Edward Ford); Europe, seven representatives; America, seven representatives; Africa, four representatives; Asia, five representatives.

2. *Amœbiasis*: It was recommended that an assessment be made of the disease and of the parasite in various parts of the world, under the auspices of some central organization such as the World Health Organization.

3. *Leishmaniasis*: It was recommended that the support of the Pan-American Sanitary Bureau should be asked for the organization of a study programme on the control of this disease wherever it is endemic in the American region; that strains of *Leishmania* be maintained in cultures (when possible also in animals) in suitably placed central laboratories (these strains can then be made available to all interested workers); that each laboratory maintains a list of the strains carried; that the World Health Organization takes cognizance of the above proposals and makes arrangements for the dissemination of information relating to leishmaniasis in all its forms.

4. *Gastro-Intestinal Infections*: It was recommended that further studies on the Enterobacteriaceæ should be made to clarify the present knowledge of the ætiology and epidemiology of the gastro-intestinal bacterial infections, especially infantile diarrhœas.

5. *Mycotic Infections*: It was recommended that the knowledge of the strains responsible for ringworm infections in Africa be completed, in order to establish a map of the dermatophytes all over the African region.

6. *Arthropod-Borne Infections*: It was recommended that, since epidemics and epizootics due to some of the arthropod-borne viruses appear at unpredictable and sometimes long intervals, the occurrence of these viruses be explored where possible, and that regional virus laboratories be available to help in the study and identification of suspected epidemics and epizootics.

7. *Respiratory and Other Virus Infections*: It was recommended that concerted international effort should be made to determine the cause, incidence and economic importance of the acute respiratory illnesses, with particular reference to tropical and subtropical areas. Further, studies should be made to develop means for control of those virus diseases which are of significance. Full cooperation and assistance should be given to the World Health Organization in its efforts to establish regional centres for the study of respiratory disease, and to receive and coordinate the findings in laboratory and epidemiological investigations of such illness.

8. *Rickettsial Infections*: It was recommended that, in view of the great interest and potentialities of the fluorescent antibody technique for diagnostic purposes, further studies should be made. It was hoped that further research could be made to clarify the ætiology and the relationship to rickettsial infections of the several disease syndromes which have been described from various parts of Africa.

9. *Anæmias and Abnormal Hæmoglobins*: It was recommended that, given the importance of thalassæmia and the hæmoglobinopathies in the tropical regions, and in view of the risks of confusion that the diversity of nomenclature may create, a meeting of experts in the subject be held at international level in order to bring about conformity in this nomenclature.

10. *Zoonoses*: It was recommended that a zoonosis section be permanently established as a part of all future Congresses.

11. *Vital Statistics*: It was recommended that emphasis be placed on the importance of collecting as precise data as possible on the demography and the health of the population, using for the purpose methods adapted to local conditions and to the type of medical and administrative staff which might be trained locally.

12. *Malaria Eradication*: It was noted with satisfaction that for the first time in their history it had been possible to devote a special section to the eradication of malaria; and that in the whole world the eradication campaign has attained a state of development which was inconceivable at the time of the Fifth Congresses. It was recommended that the campaign should be undertaken in the most efficacious way and that the necessary research should be carried out so that the aim of the eradication of malaria might be achieved.

13. *Nutrition*: It was noted that the importance of nutrition in tropical medicine had been stressed, as it had been very apparent at the meetings that nutrition and tropical diseases were very closely related. It was recommended that at the next congresses nutrition should be given an improved status and not be regarded, as at present, as a subsection of tropical physiology.

14. *Housing and Sanitary Engineering*: Recognizing the importance of sanitary engineering, housing and industrial hygiene in the control of tropical diseases and malaria, it was recommended that this section continue to be an active section in future Congresses.

15. *International Permanent Committee of Microbiological Documentation*: The announcement of the creation of an International Permanent Committee of Microbiological Documentation (Stockholm, 1958) was noted with interest, and it was recommended that a representative of tropical microbiology take part in the activities of this documentation committee.

It was decided that the Seventh International Congresses on Tropical Medicine and Malaria should be held in Brazil in 1963.

British Medical Association.

NEW SOUTH WALES BRANCH.

A MEETING of the New South Wales Branch of the British Medical Association was held in the Robert H. Todd Assembly Hall, British Medical Association House, 135 Macquarie Street, Sydney, on April 24, 1958, the President, DR. A. W. MORROW, in the chair.

Headache.

DR. E. L. DAVIS and DR. Z. S. FREEMAN each read a paper on the subject of headache. The paper by Dr. Freeman is on page 634.

DR. J. SANDS said that he was interested in the so-called tension headaches; he wondered if they were due to muscular or emotional tension. He asked whether that tension occurred in the patients or in their own minds. He was not convinced about the headaches said to be due to muscular tension, and thought that that was such a rare cause of pain in other areas; it was equally unlikely in the occiput.

Dr. Freeman said that he agreed it was rare to find a firm band on palpating the muscles. The responsible mechanism was probably vascular in most cases.

DR. B. SWAN said that during the examination of large numbers of school children for orthopædic defects she had noted that in many of those suffering from headache the muscle tissue at the back of the neck was unduly prominent on one side. In an article in the *British Medical Journal* of May 19, 1956, on headache in school children in England, it had been pointed out that sore pressure points had been

found in the necks of about 90% of those complaining of headache, and that cure had been obtained by means of neck relaxation exercises. In her own investigation Dr. Swan had found tender spots on the lateral process of the first and third cervical vertebræ. Manipulation of the cervical region produced lessening or disappearance of headaches.

Dr. Davis said that he believed muscle contraction was a real entity. He found muscle tenderness in patients suffering from tension headaches and considered that muscle relaxants such as meprobamate were of real value in treatment.

Dr. Freeman said that tender spots could be found on deep palpation in the neck and shoulder muscles of everyone, and he wondered if their presence was not physiological.

Dr. Morrow, from the chair, asked if the pain was relieved by local infiltration of tender spots.

Dr. Davis said that he did not use local infiltration. He considered that mental catharsis and the use of such drugs as meprobamate were sufficient.

DR. R. A. MONEY said that every headache should be regarded as intracranial in origin until proved otherwise. The symptoms produced by intracranial lesions were variable. X-ray examination of the skull and sinuses was essential in the investigation of everyone with headaches. He referred to a woman whose headache was diagnosed successively as being emotional, hypertensive and psychotic in origin, and who was eventually found to have a calcified tumour in the occipital area when X-ray examination was carried out. Extracranial headaches could be identified by infiltration of the painful areas with local anæsthetic. The so-called histamine cephalalgia could not be classed with a typical facial neuralgia; the latter caused constant pain, which could not be relieved. Allergic or histamine headache was a definite condition. It woke the patient at night and was throbbing in character. It was to be distinguished from migraine, which generally did not waken the patient at night. Discussing cases of headache that were "cured" by manipulation of the neck, Dr. Money referred to a patient who had been relieved by manipulation by a chiropractor for about six months and had later been shown by angiography to have a meningioma in the left parietal region. It was important to be careful about postulating that headaches came from the region of the neck, and full investigation was essential before headaches should be ascribed to emotions and tension.

DR. S. BENEDECK said that there was no such thing as an imaginary headache; in every case pain was experienced by the patient. Approaching the subject from the psychiatric angle, he pointed out that depression caused headache, and it might be relieved by electro-convulsive therapy. He was not happy about the idea that post-concussion headache was due to muscular tension and asked the speakers to discuss the causation.

Dr. Davis said that he was not convinced that organic disease was present in patients suffering from post-concussional headaches. These were usually associated with litigation and tended to disappear when the case was settled satisfactorily.

DR. C. H. M. MACMAHON disagreed with Dr. Davis. She said that she saw many people suffering from persistent post-concussional headache. She was satisfied that organic damage had been done, possibly with resultant intellectual deterioration.

Dr. R. A. Money, in reply to a question by Dr. Davis, agreed that few patients with post-concussional headaches could be shown to have dilatation of the ventricles, or to have an excess of intracranial fluid, but if these patients were encouraged to move around in the 24 hours after they had had a pneumoencephalogram, some air usually escaped into the subdural space, and their headaches were usually relieved. He suggested that might be due to the breaking down of adhesions, by air circulating in the subdural space. He did not think that dilatation of the ventricles had any association with headaches. If the injection of air relieved the headaches, one might conclude that they were being caused by subdural adhesions.

Medical Societies.

PÆDIATRIC SOCIETY OF VICTORIA.

A MEETING of the Pædiatric Society of Victoria was held on April 9, 1958, at the Royal Children's Hospital, Melbourne.

Burns and Scalds in Children.

DR. HOWARD WILLIAMS read a paper by himself, MISS NANCY BOWMAN and MISS GUDRUN MALARE entitled "A Social Study of Burns and Scalds in Children" (see M. J. AUSTRALIA, November 1, 1958, page 599).

DR. ELIZABETH WILMOT said that about 80% of children attended an Infant Welfare Centre at least once. The number attending after the age of one year would be of more significance, but was unfortunately not known, although it was certainly not great. To know the number attending pre-school centres would be even more significant, as these centres provided such a good opportunity for parent education. Dr. Wilmot thought that the time of meal preparation was the greatest danger period; considerable publicity had been given to this point.

MISS G. MALARE said that most scalds occurred when meals were being prepared, but her figures showed that this was not true of burns.

DR. DORA BIALESTOCK said that television was playing a useful role in keeping young children out of the kitchen whilst the evening meal was being prepared.

DR. A. CLARKE pointed out that the deaths of 15 patients, which had occurred in Victoria, did not all represent failures of treatment, as several children had died before they reached hospital. He thought that lessening the inflammability of clothing materials would be a most important preventive measure.

DR. B. NEAL said that in Great Britain householders were obliged by law to provide adequate fire guards. He wondered whether any such legislation was proposed here.

Dr. Wilmot replied that such legislation would be impossible to police, and that in any case parent education represented a more adult approach to the problem.

DR. H. WETTENHALL suggested that dangling electric cords were no longer a great danger precisely because of the propaganda pointing out this risk. The danger of placing hot fluids near the edge of a bench should be similarly publicized.

DR. A. WAKEFIELD said that the parents of burnt children who had received anti-burn propaganda tended to prove rather than disprove the efficiency of such propaganda. Burns were just one type of accident, and in his experience the number of possible accidents was constantly increasing. The introduction of each new appliance led to a new crop of accidents. The "progress" of civilization seemed to consist in the genius of a small percentage of the human race, which constantly increased the risks to the majority. He considered that the chances of a child being burnt depended on the intellectual capacity of his parents.

DR. B. MCCLOSKEY asked whether Dr. Williams had noticed any correlation between the incidence of burns and the standard of child care in the home. He did not think that the intelligence of the parents was the only factor. He also asked whether burnt children displayed any common characteristic.

DR. G. WEIGALL thought that the abolition of the overhanging table cloth had done much to reduce the incidence of burns. The education of the child in accident prevention could begin at a very early age.

DR. V. COLLINS asked how the figures for the ignition of clothing here compared with those from the United Kingdom. It was important that the public should realize the inflammability of cotton goods and flannelette. The avoidance of the common dangers seemed to be largely a matter of luck. Dr. Collins affirmed that the compulsory use of fire-guards in England had been an effective measure in lessening the incidence of burns. Infant welfare sisters were well placed to give useful advice regarding the guarding of radiators, which in many cases could be done for a few shillings. The various media of propaganda and all possible techniques of parent education must be used.

DR. A. DERHAM cited the case of a toddler who placed several articles of furniture together in order to reach some hot food: the ingenuity of small children should never be under-estimated.

Miss Malare, in reply to Dr. McCloskey, said that the present research did not reveal any correlation between the incidence of burns and either standards of child care or the venturesomeness of the affected child.

Dr. H. Williams summed up by saying that the study indicated that many of these accidents were preventible. While there was probably a small hard core of families in which accidents would always occur, the majority of families were responsible, of reasonable intelligence and were of good homes. These families would respond to education. In the

earlier part of this century nutritional and infectious disorders, especially infantile diarrhœa, had been common and prevalent killers. These disorders had now been reduced to a minimum by welfare centres instructing parents in better infant hygiene. The emphasis must now extend to accident prevention, and the infant and pre-school organization was the best strategically situated and best trained body to carry this education into the community.

Out of the Past.

In this column will be published from time to time extracts, taken from medical journals, newspapers, official and historical records, diaries and so on, dealing with events connected with the early medical history of Australia.

A CONTAGIOUS DISEASES HOSPITAL FOR MELBOURNE.[1]

[From the *Australasian Medical Gazette*, February, 1882.]

THE weakness of Victorian Governments generally has been further illustrated, particularly by the vacillation about a contagious diseases hospital. It has come to be a kind of joke now, that every district around Melbourne thinks any district a suitable one for a smallpox hospital save its own: and the scare about proximity to such an institution is piteous enough to be amusing. The Government—not only this Government but every other Government—has been bounced out of its resolution from time to time when any site has been fixed upon, and the latest instance of such bounce is their abandonment of the site at Fisherman's Bend, and their totally unexpected, and wholly unjustified, announcement that the Industrial School Building, in the Royal Park, is the most suitable place in which to treat smallpox, if it should break out in the city. As a matter of fact, there is no reason for alarm in connection with any site at all, so long as reasonable precautions are taken: but as the public think there is such need, it is as well to dissipate apprehension if possible, and the Government seem to think the best way to do this is to abandon a site where there is not a house within half-a-mile, and fix upon one in the thick of a very populous district.

Correspondence.

MEDICAL ETHICS AND INSURANCE REPORTS.

SIR: Dr. C. C. McKellar (M. J. AUSTRALIA, October 4, 1958) invites further comments and through his replies brings to mind Shakespeare's "Macbeth".

MACBETH: "How does your patient, doctor?"

DOCTOR: "Not so sick, my lord,
As she is troubled with thick-coming fancies
That keep her from her rest."

MACBETH: "Cure her of that,
Canst thou not minister to a mind diseas'd,
Pluck from the memory a rooted sorrow,
Raze out the written troubles of the brain
And with some sweet oblivious antidote
Cleanse the stuff'd bosom of that perilous stuff
Which weighs upon the heart. . . ."

One has to agree with C. A. Menninger that "A healthy mind is the ability to maintain an even temper, an alert intelligence, socially considerate behaviour and a happy disposition". It is wrong to take it personally when some justified criticism about one's views is expressed. Critical comments must not necessarily be applied to the whole of a letter, but they can be directed towards some specific thoughts expressed in it, and I did not and do not intend to comment on everything which Dr. McKellar wrote in his letter originally. He seemed to be under a misapprehension when he writes that he had an impression that I see patients only "from the viewpoint of an insurance doctor". I do not, but this is not important since an "insurance doctor" is not necessarily a biased person as Dr. McKellar seems to think. His remarks indicate that he believes that a doctor becomes biased when he sees patients with compensation problems depending whether for the "plaintiff" or for the "defendant". Does he himself? I must criticize such a viewpoint.

Not only lecturettes but full scope lectures are needed to prevent the harm in psychologically faulty handling of patients, especially those with litigation claims, examined in the course of their legal actions. Such expressions as "symptoms made to order", "symptoms sold to the highest bidder", "complaints nursed in order to win the case" etc. are common knowledge these days and do not require any further explanation. It is quite clear that the accident itself often does much less harm than the subsequent medico-legal examination. In a paper to the last B.M.A. Congress in Hobart I drew attention to symptoms arising from such a psychological trauma which I like to call "medico-legalogenic".

It is better to appear as "a Big Brother in relationship with a patient" if that is going to help his recovery before he becomes chronically neurotic than to pat him on the shoulder and to show him copies of reports in which the true nature of his complaints is described. A feeling of sentiment and of pity should not cloud the issue and does not necessarily imply the proper attitude. From Dr. McKellar's views one is reminded of Freud's expression that "when reason and feeling are in conflict, feeling invariably wins". Doctor-patient relationship in psychiatric problems is not based on psychological idiosyncrasies or psychological allergies or sympathies as he seems to think. The evaluation of the patient's complaints has to take into consideration not only the patient's symptoms but the total situation including the medico-legal and socio-economic aspects as was pointed out by Boshes.

I strongly feel, as I already commented in the first letter, that patients with compensation problems should not be shown the reports prepared either for their solicitors or for the defence, whether the reports are "favourable" or "unfavourable". Those reports should represent, and I hope do represent, the honest view of a consultant, and they should be kept away from the patient, otherwise they would do him much harm. The patient seeks a favourable and not necessarily an honest opinion.

I close these few remarks with H. Yellowlees's slightly modified words: "It is one of the most astonishing features of our modern life that some people who know little and care less about psychiatry seem prepared to make dogmatic pronouncements on psychiatric problems with complete self-assurance on every possible occasion." He quoted an Arab physician of 1900 years ago, Karshish, whose verse seems appropriate to conclude this letter:

"Happed to hear the land's practitioners,
Steeped in conceit, sublimed by ignorance,
Prattle fantastically on disease,
It's cause and cure—and I must hold my peace."

Yours, etc.,

"Harley",
143 Macquarie Street,
Sydney.
October 16, 1958.

OSCAR R. SCHMALZBACH.

References.

BOSHES, B. (1957), "Management of Patients with Trauma of the Nervous System"; in F. M. Forster's "Modern Therapy in Neurology"; edited by F. M. Forster. St. Louis.
MENNINGER, CARL A. (1945), "The Human Mind", New York.
SCHMALZBACH, OSCAR R. (1958), M. J. AUSTRALIA, 1: 855.
SHAKESPEARE, W., "Macbeth", Act 5, Scene 3.
YELLOWLEES, HENRY (1953), "To Define True Madness", London.

THE NATIONAL HEALTH SERVICE IN AUSTRALIA.

SIR: In reply to Dr. Jacob's letter (M. J. AUSTRALIA, October 4, 1958), I would agree that a period of general practice experience is of inestimable value to an intending specialist, especially general practice in a country district where facilities are limited and cases extremely varied.

Having had 15 years of experience in general practice, mostly in country areas, I recently decided to take time off and try for a senior degree—an F.R.C.O.G.—as I thought that it would be of help to me either if I continued in general practice, or if I decided to specialize in that branch of medicine. To my dismay, I found that I was required to spend, not one, but two years' residence in a teaching hospital before being allowed to proceed to examination. When I appealed to the Professor of Obstetrics and Gynæcology, I

[1] From the original in the Mitchell Library, Sydney.

was told that there was little chance of having the residency period reduced to one year, but that by going to Dublin and spending six months in residence at a teaching hospital, I would be eligible to sit for a degree of similar standing, namely, the D.G.O. Dublin!

Thus, one can understand why young graduates proceed straight to post-graduate work—they, unencumbered by families, etc., can afford the time and loss of income. Also, one realizes why graduates shun general practice—to their own loss—for I am sure that no specialty could provide the variety, the excitement and the challenge of general practice, especially country practice. The plain fact is that G.P. experience carries no weight when it comes to eligibility for hospital appointment, nor, apparently, does it cut any ice with members of post-graduate committees.

Yours, etc.,

C. G. BARRETT.

Fox Street,
Walgett,
New South Wales.
October 12, 1958.

ESTABLISHMENT OF A CANCER REGISTER IN N.S.W.

SIR: It is with the greatest interest that I have read a letter written by Dr. Alan Grant (M. J. AUSTRALIA, October 4, 1958) from the Maitland Hospital on the subject of cancer registration in New South Wales, which is very necessary for the medical community of this State. This need has long been recognized by the Australian Regional Council of the Royal College of Obstetricians and Gynæcologists, and that body introduced five years ago a cancer registry, through the medium of its State committees.

In attempting to establish cancer registration, a strong word of warning is necessary. The main prerequisite is to be fully conscious of exactly what is wished to be achieved. It is only worth while commencing statistical research if the results of the survey can be relied upon to be an accurate representation of the facts that the research worker wishes to assess. Many cancer registries established during the past fifteen years can only supply a minimum of reliable information because even basic data such as diagnosis and type of treatment may be suspect if it relies on anything but the most accurate and detailed history with full pathological reports.

Dr. H. O. Lancaster, in a recent article in THE MEDICAL JOURNAL OF AUSTRALIA (September 13, 1958), has shown the necessity for full and accurate registration of cancer in this State, and he has also pointed out the inadequacy of relying upon information either through death certificates or through the Registrar-General's Department. The highest possible standard of accuracy has been achieved by the Cancer Registry of the Royal College of Obstetricians and Gynæcologists, where 1200 cases of gynæcological cancer from contributing hospitals throughout Australia have been registered with the objective of studying every aspect of the disease. These case histories have been recorded on a special case record *questionnaire*, and the following information is transferred to the Hollerith punch card and is available for machine dissection:

Name, address, age, marital status.

Racial origin, country of birth, colour, social grading.

Family history of cancer and previous medical history.

Obstetrical and menstrual history, history of present illness, with chronological development of symptoms, date of diagnosis and commencement of treatment.

Findings on physical examination with an actual description of the primary disease, of metastases, and any local condition which may have ætiological significance.

Results of laboratory examination of urine, Aschheim-Zondek test, Wassermann reaction, X-ray examination and diagnostic cytology; physical diagnosis with a definite pathological diagnosis.

Type of treatment, including details of surgery or irradiation, radioactive substances and cyto-toxic substances.

Follow-up information, details of which are requested and recorded for an indefinite period after the patient's discharge.

A consultative committee examines the records of each case, and, where possible, slides are examined by a pathological consultant. The tumour is staged according to the formulæ established by the Royal College of Obstetricians and Gynæcologists, in conformity with international standards with a description of location of metastases and extension of growth. It is necessary to define combined-site tumours and to indicate whether the tumour is secondary to intrapelvic or extrapelvic cancer.

These are the minimum requirements in order to attempt to accurately analyse results. Yearly statistical records are published in the Annual Report of the Cancer Registry, which is distributed free of charge to interested hospitals, organizations and individuals in Australia and overseas. Any additional information required by research workers is available on request to the Cancer Registry. A copy of the Second Annual Report and an invitation for cooperation with this Registry has been recently forwarded to the Maitland Hospital, as well as to most New South Wales hospitals.

The only problem is finance, as the rapidly expanding sphere of this Registry now includes New Zealand, Northern Territory and New Guinea. Assistance in this regard is still only available through philanthropic sources. It is hoped that these comments by Dr. Grant, Dr. Lancaster and myself, through the columns of your Journal, will assist us in our efforts to place this urgently needed statistical survey on a sound footing in this State.

Yours, etc.,

K. A. MCGARRITY,
Honorary Director, Cancer Registry
of the Regional Council in Australia
of the Royal College of Physicians
and Gynæcologists.

215 Macquarie Street,
Sydney,
October 14, 1958.

SODIUM FLUORIDE TABLETS.

SIR: Nearly three years ago, at the suggestion of some of the Armidale dentists, I commenced using sodium fluoride tablets as part of routine ante-natal treatment. The mothers were given one sodium fluoride tablet daily throughout the ante-natal period. During the last six weeks seven of the children, who are just about two years old, have been brought to me for inspection. They all have fine regular teeth and no child has any sign of caries. At least two of the children have come from under-privileged homes and the mothers lost most of their teeth in their early twenties. I think that investigation of the question as to whether or not sodium fluoride does harden the enamel and prevent caries should be carried out where large numbers of cases would be available. I am also giving the children the same treatment, from the age of three months until three years, to harden the permanent teeth. Of course, many years will elapse before the result of the treatment will be known, but I feel we must do all possible to reduce the terrific incidence of dental caries.

Yours, etc.,

E. KENT-HUGHES.

"The Minto",
Rusden Street,
Armidale,
New South Wales.
October 14, 1958.

CARDIAC ARREST: A PLAN OF ACTION.

SIR: The paper presented by Dr. Bernard in the Journal of September 27, 1958, is of great value, and presents an adequate plan of action for the treatment of the patient in cardiac standstill or ventricular fibrillation. While in general agreement with her plan, I believe that it could be altered in several particulars, with advantage to the "arrested" heart. The question as to how one should massage the heart is of some consequence. The method which involves the use of the whole hand to compress the heart against the sternum is adequate but not optimal. It was shown by Hallstrand *et alii*[1] that squeezing the heart with the fingers behind and the thumb in front resulted in twice as great a volume flow of blood as achieved by the method in Dr. Bernard's paper. Further, the optimal blood pressure to be achieved in man by the former method is 80 millimetres of mercury, and a pressure below 60 millimetres of mercury is not adequate to maintain cerebral oxygenation.

[1] Hallstrand, H. O., Moritz, D., and Zimmerman, L. M. (1954), "Cardiac Arrest", *Illinois M. J.*, 106: 375.

The question of rate of contraction is also of importance. In our own laboratory some workers had the view that rapid contraction produced optimal pressure levels; others felt that a slower rate allowed better filling and ejection with subsequent higher peripheral blood pressure. The effect of different rates of contractions was tested experimentally in the animal laboratory; a cannula was inserted into a carotid artery of a sheep, the sheep's chest was opened in the fifth interspace and ventricular fibrillation was produced by subjecting the heart to a shock of low amperage and voltage. Of the three rates tried, the slowest produced the highest peripheral blood pressure (Figure I). This, it is felt sure, is equally applicable in man.

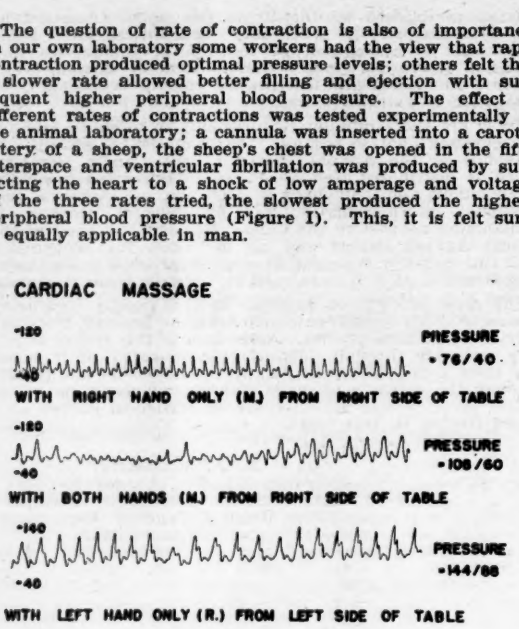

FIGURE I.

The state of the myocardium, i.e., whether flabby or not, is in most cases a direct index of its degree of oxygenation; it is unnecessary and unwise to inject adrenaline into a poorly oxygenated heart. Defibrillation can only be achieved in the fully oxygenated heart.

Like Dr. Bernard, one feels that unless a surgeon has a plan of action ready, he will not be successful in saving the patient with cardiac arrest.

Yours, etc.,

T. S. REEVE,
Senior Surgical Research Officer.
Unit of Clinical Investigation,
Royal North Shore Hospital of Sydney,
October 8, 1958.

ENDEMIC GOITRE.

SIR: In my letter of August 16 on this topic I proposed posthumous honours for Dr. McCarrison. Dr. Greenwald, of New York, has, however, lately written assuring me that Dr. McCarrison is in Oxford and "very much alive" and that honour may be paid him without any gloomy excursion into parapsychology.

I ask that you allow me to correct my error and to apologize both for the error and the tardiness of my correction—for the latter I must plead several trans-oceanic distances and my own remoteness communications-wise.

Yours, etc.,

S. F. McCULLAGH.
Finschhafen,
Territory of Papua and New Guinea,
October 11, 1958.

CORRIGENDUM.

SIR: I would like to draw your attention to an error in your issue of August 16, 1958, which I have just had the pleasure of perusing in the Boston Medical Library.

Under the heading of Post-Graduate Work, you refer to Professor Charles Illingworth, C.B.E., M.D., F.R.C.S., Professor of Surgery, University of Glasgow, as Lucas Tooth Visiting Professor to the Brisbane General Hospital. I would like to point out that the title should be the Edwin Tooth Visiting Professor in the Brisbane Hospital. I think in all fairness to the late benefactor and Lady Tooth, this should be made clear. The late Sir Edwin Tooth not only made this visiting professorship possible, but also provided for the erection of the Edwin Tooth Lecture Theatre and Research Laboratories in the Brisbane Hospital.

Yours, etc.,

ELLEN MURPHY.
Boston,
U.S.A.,
October 10, 1958.

THE ROYAL RYDE HOMES.

SIR: My board of directors desire that I draw the attention of New South Wales medical practitioners to the fact that vacancies at present exist for male patients at the "Weemala" Home of the Royal Ryde Homes. The Home caters for patients suffering from chronic illnesses. Admission is restricted to patients from 14 to 65 years of age, but mentally defective, epileptic, infectious, tubercular and venereal cases are not admitted. Indication of whether or not a patient will be considered for admission can be obtained by contacting the Matron at WY 0318. Applications will also be received for admission of patients to the "Moorong" Home catering for cancer cases for which there is no age limit.

Yours, etc.,

J. M. CORNWELL,
Secretary.
"Weemala",
259 Morrison Road,
Ryde,
New South Wales.
October 21, 1958.

Post-Graduate Work.

THE MELBOURNE MEDICAL POST-GRADUATE COMMITTEE.

SUMMARY OF COURSES TO BE CONDUCTED IN MELBOURNE IN 1959.

THE following schedule has been drawn up as a guide for those who may be planning post-graduate study in Melbourne in 1959.

Courses for Higher Qualifications.

Part I.

Courses suitable for candidates for Part I of the M.D., M.S., M.G.O., D.G.O., D.O., D.L.O., D.P.M., D.D.R., D.T.R., D.C.R.A., D.A., and for Primary F.R.A.C.S. and Primary F.F.A.R.A.C.S.:

Anatomy. The course commences on February 16, and is conducted on Monday and Wednesday afternoons for five months.

Physiology. The course commences on March 2, and is arranged similarly to that in anatomy.

Pathology. The course commences on March 2, and is conducted on Monday and Wednesday afternoons for four months.

Physics. The course commences on March 5, and is conducted on Thursday afternoons for eighteen weeks.

Microbiology. The course commences on April 7, and is conducted on Tuesday afternoons for twenty weeks.

Psychology I. The course, conducted by the University of Melbourne, commences in mid-March, and is conducted for five hours per week till late October.

Part II.

The following courses are for Part II candidates:

A course in medicine, suitable for candidates for senior medical qualifications, such as M.D. or M.R.A.C.P., will commence in May or early June and continue each afternoon for six weeks at St. Vincent's Hospital, to be conducted by the honorary medical staff.

A course in surgery, suitable for candidates for senior surgical qualifications, such as M.S. or F.R.A.C.S., will be conducted by the Royal Australasian College of Surgeons, commencing on a date to be announced.

A basic course in microbiology, suitable for candidates for M.S., M.G.O. and the diplomas, will commence on April 7 and continue on Tuesday afternoons for twenty weeks.

A course in basic pathology, suitable for candidates for M.S., M.G.O. and the diplomas, will commence on March 2 and continue on Monday and Wednesday afternoons for four months.

The College of Radiologists will arrange courses in radiodiagnosis and special pathology suitable for candidates for the D.D.R. and Part II of the D.C.R.A. when candidates present themselves.

Courses in radiotherapy and special pathology suitable for candidates for the D.T.R. and Part II of the D.C.R.A. will also be arranged when candidates present themselves.

Courses in psychiatry for the D.P.M. will be conducted by the Australasian Association of Psychiatrists and the Victorian Mental Hygiene Authority commencing in mid-March and continuing part time for three and six months; there will also be courses in neuropathology at times to be announced. A course in psychopathology conducted by the University of Melbourne will commence in March, continuing part time for eight months.

A course for the D.L.O. in laryngology, otology and pathology will be arranged by the Victorian division of the Otolaryngological Society when sufficient candidates present themselves.

The Ophthalmological Society will conduct courses in ophthalmology and special pathology for the D.O., commencing on April 13 and continuing part time for four or five months.

Courses for the M.G.O. and the D.G.O. in gynæcology, obstetrics and special pathology will be arranged when sufficient candidates present themselves.

The Victorian Division of the Faculty of Anæsthetists, Royal Australasian College of Surgeons, will announce details regarding a course in anæsthetics for the D.A. and the F.F.A.R.A.C.S.

Refresher Courses.

A refresher course in gynæcology and obstetrics for recent graduates will commence at the Royal Women's Hospital on February 9 and continue full time for two weeks.

A refresher course in gynæcology and obstetrics for general practitioners will be conducted at the Royal Women's Hospital, full time, for two weeks commencing September 7.

Refresher courses in medicine and surgery for general practitioners will commence on April 27 and in late September at metropolitan hospitals, and each will run for one week full time.

A post-graduate week will be conducted by the honorary staff of the Royal Children's Hospital for one week from August 31.

Information.

The Melbourne Medical Post-Graduate Committee will conduct all courses not attributed in the foregoing to other organizations.

Commencement of courses depends on receipt of a satisfactory number of enrolments, the closing date in each case being two weeks before the date stated for commencement. Inquiries regarding all courses, and enrolments, should be made through the conducting body; except in the cases of the medicine, the laryngology, otology and pathology, the ophthalmology and special pathology courses, the pædiatric refresher course, and the psychiatry course conducted by the Australian Association of Psychiatrists, when they should be made through the Melbourne Medical Post-Graduate Committee.

The address of the Melbourne Medical Post-Graduate Committee is 394 Albert Street, East Melbourne, C.2, telephone FB 2547.

Notes and News.

Collection of Historical Microscopes.

A small collection of historical microscopes from the seventeenth to the early nineteenth century is now on display in the Museum of the Anatomy Department in the University of Melbourne. The collection will be on view until the end of the year, and any members of the British Medical Association who would like to see the collection

DISEASES NOTIFIED IN EACH STATE AND TERRITORY OF AUSTRALIA FOR THE WEEK ENDED OCTOBER 18, 1958.[1]

Disease.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Northern Territory.	Australian Capital Territory.	Australia.
Acute Rheumatism	3(3)	1(1)	5(3)	2	1	..	..	..	12
Amœbiasis	..	..	..	..	..	..	1	..	1
Ancylostomiasis	..	..	..	..	..	..	6	..	6
Anthrax	..	..	..	..	..	..	..	..	..
Bilharziasis	..	..	..	..	..	..	..	..	..
Brucellosis	..	..	..	..	..	..	..	..	..
Cholera	..	..	..	..	..	..	..	..	..
Chorea (St. Vitus)	..	1(1)	..	..	..	..	..	..	1
Dengue	..	..	..	..	..	..	..	..	..
Diarrhœa (Infantile)	4(3)	12(11)	4(3)	..	..	1	1	1	23
Diphtheria	1	..	1	..	..	..	..	..	2
Dysentery (Bacillary)	..	..	1	..	1	..	2	..	4
Encephalitis	..	1	..	..	..	..	..	..	1
Filariasis	..	..	..	..	..	..	..	..	..
Homologous Serum Jaundice	..	..	..	..	..	..	..	..	..
Hydatid	..	1	..	..	..	1	..	..	2
Infective Hepatitis	131(44)	37(20)	10	6(3)	2(2)	1	4	..	191
Lead Poisoning	..	..	..	..	..	..	..	..	..
Leprosy	..	..	..	..	13[2]	..	1	..	14
Leptospirosis	..	..	2	..	..	..	..	..	2
Malaria	..	..	..	..	..	..	2	..	2
Meningococcal Infection	..	1(1)	..	..	..	..	..	..	1
Ophthalmia	..	..	..	..	..	..	..	..	..
Ornithosis	..	..	..	..	..	..	..	..	..
Paratyphoid	..	..	..	..	..	..	..	..	..
Plague	..	..	..	..	..	..	..	..	..
Poliomyelitis	2	..	..	..	..	..	..	..	2
Puerperal Fever	1(1)	1(1)	..	..	..	..	..	..	2
Rubella	..	62(47)	2(2)	4(4)	154(146)	2(2)	1	5	230
Salmonella Infection	..	..	..	..	..	..	..	..	..
Scarlet Fever	11(4)	27(17)	..	6(3)	3(2)	..	..	..	47
Smallpox	..	..	..	..	..	..	..	..	..
Tetanus	..	..	2	..	..	..	..	..	2
Trachoma	..	..	..	..	16	..	..	..	16
Trichinosis	..	..	..	..	..	..	..	..	..
Tuberculosis	16(11)	7(4)	15(3)	2(2)	14(11)	1	3	1	59
Typhoid Fever	1(1)	1(1)	..	..	..	..	..	..	2
Typhus (Flea-, Mite- and Tick-borne)	..	..	..	..	1(1)	..	..	..	1
Typhus (Louse-borne)	..	..	..	..	..	..	..	..	..
Yellow Fever	..	..	..	..	..	..	..	..	..

[1] Figures in parentheses are those for the metropolitan area.
[2] One case from Northern Territory.

are asked to contact Dr. Kenneth Russell, Associate Professor of Anatomy and Reader in Medical History, who will be pleased to show them the collection.

Peaceful Uses of Atomic Energy.

The second International Conference on the Peaceful Uses of Atomic Energy, held at Geneva during the first week of September, was an international event of some importance. As a contribution to the discussions of the conference, the United States Atomic Energy Commission authorized the publication of a set of 12 volumes on the peaceful uses of the atom, written by leading United States scientists, for distribution to the delegates of the various nations taking part. It is stated that much information on the latest American advances in atomic energy has been declassified (i.e., removed from the secret list) for inclusion in these volumes.

Most of the volumes were designed for a technical audience, but a few are of general or special medical interest. The titles include: "Radiation Biology and Medicine", with more than 50 contributors; "Project Sherwood—The U.S. Program in Controlled Fusion", which is written for the thoughtful layman, in terms intelligible to the general reader, and is stated to offer the first authoritative account of the search for control of thermonuclear reactions: "The Shippingport Pressurized Water Reactor", which describes the first U.S. reactor to produce commercial electric power (this began operation last May).

The volumes are being published by the Addison-Wesley Publishing Company, Reading, Massachusetts, and can be obtained through normal channels.

Notice.

THE CHILDREN'S MEDICAL RESEARCH FOUNDATION OF N.S.W.

THE following is a list of donations to the Children's Medical Research Foundation of N.S.W. received from members of the medical profession in the period October 15 to 21, 1958:

Dr. Paul Botond: £52 10s.

Dr. Clifton Walker: £26 5s.

Dr. R. H. Macdonald, Dr. Howard S. Moore: £10 10s.

Dr. R. J. G. Erby: £10 0s. 6d.

Drs. J. Marks and B. McEwen: £5 5s. 6d.

Dr. and Mrs. W. A. Distin Morgan, Dr. H. B. Cribb, Dr. A. Brauner, Dr. P. H. Doyle, Dr. and Mrs. Ewen Sussman: £5 5s.

Dr. Wilson L. Corlis, Dr. M. Henley, Dr. I. Glaser, Dr. A. M. MacIntosh: £5.

Previously acknowledged: £6926 10s. 9d. Total received to date: £7088 2s. 3d.

Medical Practice.

NATIONAL HEALTH ACT.

THE following notice is published in the *Commonwealth of Australia Gazette*, No. 65, of October 23, 1958.

NATIONAL HEALTH ACT, 1953-1957.

Notice in Pursuance of Section 134A.

Notice is hereby given that, the Medical Services Committee of Inquiry for the State of Victoria, after investigation, having reported on the third day of September, 1958, concerning the conduct of Geoffrey Gray Stilwell of 180 Hawthorn Road, Caulfield, a medical practitioner, in relation to his provision of medical services under Part IV of the National Health Act, 1953-1957, I, Donald Alastair Cameron, Minister of State for Health, did on the 2nd day of October, 1958, reprimand the said Geoffrey Gray Stilwell.

Dated this 2nd day of October, 1958.

DONALD A. CAMERON,
Minister of State for Health.

Medical Appointments.

Dr. R. F. Warnock has been appointed Government Medical Officer at Babinda, Queensland.

The undermentioned have been appointed as members of the Medical Board of South Australia, pursuant to the provisions of the *Medical Practitioners Act*, 1919-1955: nominated by the Honourable the Chief Secretary—Sir Philip Messent, Dr. J. W. Rollison, Dr. F. K. Mugford; nominated by the Council of the University of Adelaide—Dr. F. R. Hone; nominated by persons registered under Section 5 (2)—Dr. C. O. F. Rieger.

Diary for the Month.

Nov. 11.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
Nov. 11.—Western Australian Branch, B.M.A.: General Meeting.
Nov. 12.—Victorian Branch, B.M.A.: Branch Meeting.
Nov. 13.—New South Wales Branch, B.M.A.: Public Relations Committee.
Nov. 14.—Queensland Branch, B.M.A.: Council Meeting.
Nov. 14.—Tasmanian Branch, B.M.A.: Branch Council.
Nov. 17.—Victorian Branch, B.M.A.: Finance, House and Library Subcommittee.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Medical Secretary, 135 Macquarie Street, Sydney): All contract practice appointments in New South Wales. Anti-Tuberculosis Association of New South Wales. The Maitland Hospital.

South Australian Branch (Honorary Secretary, 80 Brougham Place, North Adelaide): All contract practice appointments in South Australia.

Editorial Notices.

ALL articles submitted for publication in this Journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given: surname of author, initials of author, year, full title of article, name of journal, volume, number of first page of the article. The abbreviations used for the titles of journals are those adopted by the Quarterly Cumulative Index Medicus. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors submitting illustrations are asked, if possible, to provide the originals (not photographic copies) of line drawings, graphs and diagrams, and prints from the original negatives of photomicrographs. Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary is stated.

All communications should be addressed to the Editor, THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: MW 2651-2-3.)

Members and subscribers are requested to notify the Manager, THE MEDICAL JOURNAL OF AUSTRALIA, Seamer Street, Glebe, New South Wales, without delay, of any irregularity in the delivery of this Journal. The management cannot accept any responsibility or recognize any claim arising out of non-receipt of journals unless such notification is received within one month.

SUBSCRIPTION RATES.—Medical students and others not receiving THE MEDICAL JOURNAL OF AUSTRALIA in virtue of membership of the Branches of the British Medical Association in Australia can become subscribers to the Journal by applying to the Manager or through the usual agents and booksellers. Subscriptions can commence at the beginning of any quarter and are renewable on December 31. The rate is £5 *per annum* within Australia and the British Commonwealth of Nations, and £6 *per annum* within America and foreign countries, payable in advance.